Tables:

1 Range of Cigarette Design Parameters
2 Health Canada Test Methods for Mainstream Smoke and Whole Tobacco
3 Averaged ISO Mainstream Smoke Constituent Yields
4 Mainstream Smoke Constituents at the Limits of Detection (LOD) and Limits of Quantitation (LOQ)
5 Weighted Regression of ISO Smoke Constituent Yields with ISO Tar, Nicotine or Carbon Monoxide
6 Prediction Errors Using ISO Tar with Weighted Linear Regression or Transformed Variable Regression
7 Weighted Regression Statistics for Vapor Phase Smoke Constituents with Tar and Carbon Factor
8 Averaged Constituent Yields in Tobacco Filler
9 Average Measured Yield Coefficient of Variation (%CV) and Absolute Relative Prediction Errors (ARPE) for Validation Brands
10 Variability of Analytical Methods with Time in the Analysis of 1R4F
11 Mainstream Smoke Constituent ISO Yields for a Commercial Brand Over a Nine-month Period
12 Comparison of Reported Kentucky Reference 1R4F Cigarette Mainstream Smoke Constituent Yields from Different Laboratories

Figures:

1 Regression Plots from Weighted Linear Regression with 1/tar Weighting
2 Example Partitioning of Smoke Yields for Carbon Filter Design in Exploratory Brands
3 Multiple Regression Examples with ISO Tar and Carbon Factor
4 Prediction Models for ISO Mainstream Tobacco Specific Nitrosamine Yields
5 Prediction Models for ISO Mainstream Nitrogen Oxides Yields

PM3006878225

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 1: Range of Cigarette Design Parameters

Cigarette Features	Number / Type	Ranges
Brands	15 Brand Families	48 Brand Styles
Philip Morris Production Regions (1)	6	USA, Latin America, Asia Pacific, Japan, EU, CEMA
ISO Tar		1 - 14 mg/cig
Filter Types (2)	6	Cellulose acetate (CA), CA/carbon (three types), Concentric paper
Filter Ventilation		0 - 80%
Cigarette Length	7	68 - 100 mm
Cigarette Circumference	2	Slim (~ 23 mm) and Standard (~ 25 mm)
Cigarette Paper Permeability (3)		9 - 87 CORESTA Units
Menthol Flavoring	2	5 menthol, 44 non-menthol
Tobacco Weight		0.49 - 0.89 g/cig
Tobacco Blend	2	Approximately 100% Virginia (bright) or Blends of bright, burley, Oriental tobaccos
Packaging	2	41 Hard Pack, 7 Soft Pack

(1) EU = European Union, CEMA = Central Europe, Middle East, Africa

(2) CA = cellulose acetate, CA/Carbon is a filter containing both a CA section and a section with carbon on CA

(3) CORESTA Unit (CU) = air flow, cc/min, passing through a 1 cm^2 test apparatus surface at 1.0 kPa pressure

PM3006878226

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 2: Health Canada Test Methods for Mainstream Smoke and Whole Tobacco

Mainstream Smoke	Health Canada Official Methods	Replicates/Cigarettes per Replicate
Tar, nicotine, carbon monoxide	T-115	20 / 5
Carbonyls formaldehyde, acetaldehyde, methyl ethyl ketone (MEK), acetone, propionaldehyde, acrolein, crotonaldehyde, butyraldehyde	T-104	7 / 2
Volatile Organics 1,3-butadiene, isoprene, acrylonitrile, benzene, toluene	T-116	7 / 10
Phenolics hydroquinone, resorcinol, phenol, catechol, o-cresol, m & p-cresols	T-114	7 / 5
Aromatic Amines 1- and 2-aminonaphthalene, 3- and 4-aminobiphenyl	T-102	7 / 10
nitric oxide (NO), total oxides of nitrogen (NOx)	T-110	7 / 1
hydrogen cyanide	T-107	7 / 5
ammonia	T-101	7 / 10
benzo[a]pyrene	T-103	7 / 5
pyridine, quinoline, styrene	T-112	7 / 20
Tobacco Specific Nitrosamines N-nitrosonornicotine (NNN), 4-(N-methyl-N-nitrosamino)-1-(3-pyridyl)-1-butanone (NNK), N-nitrosoanatabine (NAT), N-nitrosanabasine (NAB)	T-111	7 / 10
Mercury	T-108	7 / 40
Metals cadmium, lead, chromium, nickel, arsenic, selenium	T-109	7 / 20
pH	T-113	7 / 1
Whole Tobacco		
Nitrate	T-308	3 / 6 grams
Tobacco Specific Nitrosamines N-nitrosonornicotine (NNN), 4-(N-methyl-N-nitrosamino)-1-(3-pyridyl)-1-butanone (NNK), N-nitrosoanatabine (NAT), N-nitrosanabasine (NAB)	T-309	3 / 36 grams

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 3: Averaged ISO Mainstream Smoke Constituent Yields

Sample Code	Brand / Region (1)	tar (mg/cig)		nicotine (mg/cig)		carbon monoxide (mg/cig)		acetaldehyde (µg/cig)		acetone (µg/cig)		acrolein (µg/cig)		butyraldehyde (µg/cig)		crotonaldehyde (µg/cig)		methyl ethyl ketone (µg/cig)		propionaldehyde (µg/cig)	
	Exploratory Brand Set	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
E1	L & M King F HP / EU	12.6	0.6	0.81	0.03	11.5	0.5	598	5	330	12	57.6	3.0	40.9	2.1	23.3	0.9	74.5	3.7	59.3	2.8
E2	Merit King F HP / EU	7.0	0.4	0.54	0.03	8.1	0.5	384	20	224	5	35.8	2.1	25.8	1.5	10.0	1.1	46.1	1.9	36.4	2.7
E3	Marlboro King F HP (Norway) / EU	13.2	0.7	0.93	0.05	11.3	0.8	540	85	287	34	51.0	7.7	33.9	5.2	19.5	3.2	65.6	8.9	50.2	7.1
E4	Chesterfield INTL King F HP Ultra-Lt / EU	3.4	0.2	0.30	0.01	3.4	0.2	148	10	108	5	12.5	0.9	11.4	0.7	NQ	NQ	17.6	0.9	14.3	1.3
E5	Parliament 100 F SP / CEMA	10.2	0.4	0.77	0.04	10.2	0.5	409	41	201	29	31.4	5.9	20.9	3.0	6.6	1.3	31.8	5.8	33.6	5.0
E6	Philip Morris One King F HP / EU	1.6	0.2	0.16	0.01	2.0	0.2	76	12	65	7	5.4	1.1	6.2	1.1	NQ	NQ	8.0	1.5	7.1	0.9
E7	Marlboro Long Size F HP (Argentina) / Latin America	13.9	0.5	1.00	0.04	13.4	0.6	626	36	344	13	61.9	3.6	40.3	1.8	24.9	1.6	76.4	4.7	59.5	1.9
E8	Parliament King F HP Lt (Japan) / US Export	7.0	0.4	0.57	0.03	7.5	0.3	218	41	117	24	14.8	2.7	11.0	1.8	NQ	NQ	16.6	3.7	15.8	3.3
E9	L & M King F HP Lt / EU	8.4	0.4	0.58	0.03	8.4	0.3	397	21	220	8	35.6	1.9	26.0	1.8	10.9	0.9	45.1	1.9	36.1	1.9
E10	Marlboro Long Size F HP (Venezuela) / Latin America	13.1	0.8	0.91	0.05	11.1	0.7	504	68	276	33	45.7	6.0	32.2	3.8	17.8	3.5	59.3	7.6	48.2	6.5
E11	Marlboro King F HP (Taiwan) / US Export	11.6	0.9	0.93	0.04	9.6	0.6	384	46	203	22	32.1	3.8	21.9	2.8	8.0	1.4	37.2	5.0	33.8	3.3
E12	F6 King F HP Lt / EU	8.4	0.4	0.71	0.04	8.6	0.4	363	53	209	20	33.0	5.3	25.3	2.9	10.1	1.6	46.2	4.7	34.1	3.5
E13	Virginia Slims 100 F HP Menthol 1mg (Japan) / US Export	0.9	0.1	0.10	0.01	1.1	0.1	32	12	46	6	NQ	NQ	NQ	NQ	BDL	BDL	NQ	NQ	NQ	NQ
E14	Marlboro King F HP Lt (Germany+Great Britain) / EU	5.9	0.3	0.53	0.03	6.4	0.2	323	43	182	13	30.1	4.2	21.4	2.6	7.0	1.1	36.3	3.6	30.7	3.5
E15	Virginia Slims 100 F HP Ultra-Lt Menthol (Japan) / US Export	2.7	0.2	0.23	0.02	3.1	0.3	114	25	96	17	8.7	2.1	8.8	1.8	NQ	NQ	13.3	3.0	11.0	2.0
E16	Parliament 100 F SP Lt / US	11.6	0.6	0.95	0.05	11.4	0.6	481	29	239	10	38.6	2.8	26.1	1.8	8.8	0.9	44.0	2.6	41.0	3.4
E17	Marlboro King F SP / US	14.2	0.5	1.02	0.04	12.9	0.6	601	43	318	12	50.4	5.8	39.7	3.6	20.1	2.4	71.7	6.3	65.7	1.6
E18	Marlboro 100 F HP / EU	12.6	0.5	0.93	0.04	11.6	0.6	554	33	291	18	51.3	3.4	35.8	2.6	17.4	1.4	67.3	5.1	51.5	3.0
E19	Marlboro 100 F HP Lt (Germany) / EU	6.9	0.2	0.63	0.02	7.1	0.4	311	39	178	14	27.5	4.7	19.5	2.3	6.0	1.1	34.4	3.5	28.6	3.4
E20	SG Ventil Regular F SP / EU	11.1	0.5	0.67	0.03	9.1	0.4	488	45	267	22	44.3	4.7	33.7	2.3	20.5	1.8	61.8	4.6	47.0	4.5
E21	Muratti King F HP Ultra-Lt 1mg / CEMA	1.0	0.2	0.11	0.01	1.3	0.1	57	11	59	9	3.6	0.7	5.4	0.8	NQ	NQ	6.6	0.6	5.7	0.6
E22	Diana King F SP Specially Mild / EU	9.7	0.3	0.74	0.03	8.8	0.3	390	63	223	26	39.1	8.1	27.7	4.5	13.9	2.4	48.7	7.2	39.2	5.6
E23	Muratti Ambassador King F HP / EU	8.4	0.4	0.65	0.05	7.5	0.4	286	43	146	22	19.7	3.7	15.4	1.9	4.9	0.9	24.7	4.0	23.6	3.4
E24	Merit King F SP Ultra-Lt (PaperSelect) / US	4.9	0.2	0.46	0.03	5.9	0.3	254	50	165	28	20.4	4.7	19.5	3.9	5.8	1.7	31.1	6.1	25.0	4.6
E25	Petra Regular F HP / CEMA	13.3	0.6	0.85	0.03	11.2	0.4	515	71	287	34	43.8	6.1	37.6	4.3	20.7	3.5	69.7	9.0	49.2	6.4
E26	Marlboro King F HP Ultra-Lt Menthol / US	5.9	0.5	0.49	0.04	6.9	0.4	277	48	170	25	25.7	4.0	20.5	3.6	6.7	1.6	33.0	5.4	26.9	3.5
E27	Diana King F HP Ultra-Lt / EU	3.0	0.2	0.29	0.02	3.3	0.2	146	16	103	12	13.0	2.0	10.9	1.2	NQ	NQ	16.8	2.0	14.5	1.8
E28	Marlboro King F HP (Malaysia) / Asia Pacific	14.4	0.5	1.03	0.04	11.9	0.7	604	28	316	19	58.7	3.5	43.6	3.5	23.3	2.1	69.2	5.1	60.4	3.5
E29	Marlboro King F HP 25's (Australia) / US Export	13.1	0.6	0.98	0.05	12.3	0.9	517	45	291	29	47.4	3.6	36.2	4.5	17.8	2.7	62.6	6.9	49.7	3.6
E30	Marlboro King F HP (Japan) / Japan	12.1	0.5	1.04	0.05	11.2	0.6	481	31	257	14	36.6	2.8	23.9	2.2	9.2	1.1	46.2	3.9	39.5	2.6
E31	Longbeach One King F HP / Australia	1.2	0.1	0.15	0.02	1.6	0.1	113	19	98	7	8.7	1.5	8.2	1.0	NQ	NQ	15.0	2.4	11.1	1.7
E32	Chesterfield Originals King F HP Lt / EU	6.0	0.5	0.59	0.02	8.3	0.4	432	42	243	19	41.3	3.1	27.0	2.5	12.4	1.1	51.7	5.1	40.4	3.0
E33	Philip Morris 100 F HP Super Lights / EU	3.3	0.3	0.33	0.02	3.5	0.2	161	11	115	10	13.0	1.0	12.2	0.7	NQ	NQ	19.4	2.2	14.9	1.2
E34	Chesterfield Originals King F HP / EU	11.9	0.5	0.80	0.04	11.7	0.7	585	36	319	19	57.0	3.7	38.8	2.6	22.6	2.3	74.7	5.9	53.5	4.2
E35	Marlboro King F HP Medium / EU	9.6	0.4	0.72	0.03	10.0	0.7	458	36	262	15	41.2	2.6	29.2	1.4	13.5	0.9	57.9	3.5	42.9	3.6
E36	Virginia Slims 100 F HP Ultra-Lt Menthol / US	5.1	0.3	0.45	0.02	4.9	0.3	207	34	139	17	20.5	3.7	14.4	1.8	4.6	1.0	24.6	3.9	20.0	2.4
E37	Marlboro King F HP Ultra-Lt / EU	3.0	0.2	0.29	0.01	3.5	0.1	150	5	105	7	11.8	1.0	10.4	0.7	NQ	NQ	16.5	0.9	14.0	1.1
E38	L & M King F HP (Malaysia) / Asia Pacific	13.5	0.4	1.01	0.03	10.4	0.3	591	53	292	15	57.2	6.3	39.3	3.5	21.8	2.4	64.3	4.6	54.6	4.7
E39	Marlboro King F HP Lt (Japan) / Japan	5.9	0.3	0.44	0.02	6.8	0.4	227	22	126	13	16.7	2.2	11.0	1.0	NQ	NQ	17.8	2.3	18.2	2.5
	Validation Brand Set																				
V1	Marlboro King F HP Lt (Norway) / EU	8.3	0.4	0.69	0.04	8.5	0.4	383	41	201	17	30.8	4.6	24.7	3.7	10.9	1.7	41.8	4.2	32.8	3.9
V2	Raffles 100 F HP / EU	12.3	0.5	1.19	0.10	12.8	0.7	643	40	335	18	60.3	4.5	47.5	3.3	28.3	2.9	78.0	6.1	56.4	3.3
V3	Chesterfield King F HP Lt / EU	6.3	0.2	0.54	0.04	7.3	0.3	319	17	176	10	27.6	1.5	20.9	1.5	8.9	1.1	34.5	2.8	28.1	1.7
V4	Philip Morris King F HP Super Lights / EU	4.1	0.4	0.40	0.03	4.0	0.3	147	16	97	9	12.1	1.6	11.4	1.2	NQ	NQ	15.9	1.7	13.8	1.6
V5	Merit King F SP Ultima (PaperSelect) / US	1.3	0.2	0.13	0.01	2.4	0.1	129	13	87	5	9.7	0.8	10.2	1.6	NQ	NQ	13.4	1.1	11.8	1.1
V6	Marlboro 100 F HP Lt / US	9.8	0.4	0.80	0.05	10.7	0.3	461	61	262	30	42.6	6.4	33.1	4.2	15.8	2.6	53.9	6.1	42.6	4.5
V7	Peter Jackson King F HP Menthol / Australia	7.4	0.4	0.72	0.06	8.3	0.4	396	31	224	15	39.9	3.2	27.0	1.6	16.5	1.9	48.4	3.5	35.4	2.6
V8	Marlboro King F HP (Mexico) / Latin America	13.2	0.5	1.13	0.06	12.1	0.5	520	49	298	26	50.7	5.3	35.7	3.2	22.8	2.8	62.8	6.4	47.8	4.3
V9	Marlboro King F HP (Brazil) / Latin America	12.1	0.7	0.97	0.09	11.4	0.5	527	84	288	25	47.7	6.4	36.9	4.7	22.6	3.0	64.2	5.4	48.0	5.4
	Reference Cigarettes																				
R1	1R4F Kentucky Reference	9.1	0.4	0.73	0.04	11.6	0.6	574	57	312	22	46.3	4.8	36.8	3.6	14.9	1.5	75.0	6.4	55.9	5.6
R2	1R4F Kentucky Reference	8.9	0.4	0.77	0.07	12.2	0.5	518	43	282	21	38.5	3.4	36.1	5.5	15.4	1.5	63.8	5.4	48.1	3.8

(1) Brand names are trademarks of Philip Morris USA, Inc., Philip Morris Products S.A., Philip Morris Limited (Australia), Philip Morris CR, A.S., Tabaqueria, S.A., or F6 Cigarettenfabrik Dresden GmbH, De.

(2) N-nitrosonomicotine (NNN), 4-(N-methyl-N-nitrosamino)-1-(3-pyridyl)-1-butanone (NNK), N-nitrosoanatabine (NAT), N-nitrosoanabasine (NAB)

(3) BDL = below the detection limit, NQ = below the limit for quantitation

(4) HP = hard pack, SP = soft pack, F = filter, Lt = lights

PM3006878228

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 3: Averaged ISO Mainstream Smoke Constituent Yields

Sample Code	formaldehyde (µg/cig)		acrylonitrile (µg/cig)		benzene (µg/cig)		1,3-butadiene (µg/cig)		isoprene (µg/cig)		styrene (µg/cig)		toluene (µg/cig)		ammonia (µg/cig)		hydrogen cyanide (µg/cig)		nitric oxide (µg/cig)		nitrogen oxides (µg/cig)		1-aminonaphthalene (ng/cig)		2-aminonaphthalene (ng/cig)	
	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
E1	42.8	2.4	10.1	0.7	44.8	2.6	45.5	3.4	356	18	10.5	0.7	69.9	5.3	17.5	1.3	116.6	7.1	153	11	155	10	17.5	3.1	10.7	1.6
E2	20.9	3.4	6.9	0.5	32.8	1.4	35.4	1.7	295	13	5.2	0.3	46.7	2.7	11.2	1.0	61.8	4.5	141	14	145	17	11.6	1.0	7.6	0.7
E3	38.2	7.6	10.7	0.4	43.6	1.5	45.7	2.9	385	21	9.3	0.6	67.6	2.9	17.8	1.5	114.4	8.0	156	16	158	16	18.2	2.1	11.1	1.2
E4	6.7	2.1	2.8	0.3	17.5	0.7	17.9	1.4	150	11	2.5	0.3	24.2	1.8	5.6	0.5	13.4	2.0	59	5	61	5	7.8	1.1	4.7	0.7
E5	23.3	2.9	5.8	0.4	23.2	1.9	39.0	1.9	286	23	2.7	0.2	28.7	2.6	17.8	1.5	58.5	6.8	184	18	186	18	19.8	2.8	11.9	1.7
E6	3.4	0.7	1.8	0.2	11.0	0.9	12.8	1.4	130	12	1.4	0.1	13.9	1.6	4.4	0.5	6.8	0.8	67	8	69	8	5.9	0.7	3.7	0.4
E7	52.1	5.2	11.3	0.7	44.1	2.1	48.5	2.8	475	34	10.2	0.7	66.0	2.6	16.2	1.8	132.5	4.5	177	11	182	11	15.7	2.6	9.9	1.6
E8	10.8	1.2	3.6	0.4	15.1	1.3	23.9	0.8	195	10	1.9	0.3	20.5	1.4	12.7	1.1	28.7	2.9	161	14	162	14	14.8	1.2	9.4	0.5
E9	24.8	4.8	7.0	0.3	34.7	1.3	34.6	1.4	271	11	5.9	0.6	52.3	2.4	11.5	1.7	58.3	4.5	115	15	117	16	13.8	2.1	8.6	1.2
E10	35.2	4.5	9.8	0.3	37.7	1.2	43.8	2.1	414	20	7.7	0.4	58.9	4.1	19.7	1.9	112.8	5.8	148	11	151	12	20.4	2.6	12.1	1.2
E11	24.1	5.9	5.9	0.4	26.8	1.8	36.4	0.7	313	17	3.4	0.4	37.2	3.2	22.2	0.9	99.5	7.1	231	26	239	26	21.4	2.3	13.4	1.7
E12	31.2	6.3	4.9	0.3	35.0	2.6	35.4	3.0	276	18	5.0	0.3	49.5	6.1	10.0	0.7	73.2	5.3	58	10	60	10	10.7	2.2	6.5	1.0
E13	1.6	0.6	NQ	NQ	6.3	0.5	6.4	0.2	74	3	NQ	NQ	NQ	NQ	3.2	0.3	3.4	0.5	31	3	32	3	3.2	0.5	2.2	0.3
E14	22.1	6.7	3.7	0.3	25.9	1.1	30.8	1.6	270	16	3.4	0.3	35.6	3.0	9.3	0.6	45.6	4.4	78	16	81	15	10.7	0.6	6.9	0.7
E15	3.5	1.0	1.7	0.1	16.0	1.5	16.1	1.6	164	8	1.3	0.2	21.5	3.2	6.3	0.5	15.4	1.7	81	13	83	14	8.9	1.7	5.6	0.8
E16	29.9	6.7	5.3	0.3	26.2	1.9	37.7	1.4	330	15	2.7	0.4	35.0	4.2	22.2	1.3	106.5	8.0	223	16	231	15	21.5	2.2	13.5	1.6
E17	33.0	8.5	10.0	0.8	45.2	3.1	50.8	3.1	484	31	8.8	0.7	68.8	5.5	25.9	0.6	194.4	12.7	242	14	254	15	22.5	4.1	13.8	2.1
E18	36.6	8.8	8.7	0.7	43.8	3.4	45.9	1.2	411	17	7.3	0.5	66.0	5.6	21.7	0.7	120.2	12.9	153	14	159	14	22.4	3.8	13.3	1.0
E19	13.5	3.0	4.8	0.6	30.2	2.5	31.9	1.8	299	17	3.7	0.4	41.2	4.9	10.4	0.2	51.0	2.9	87	9	90	10	14.9	2.2	8.9	1.6
E20	41.7	5.3	8.2	0.6	31.8	2.2	35.2	2.9	281	15	9.4	0.8	47.0	3.6	12.7	1.2	107.1	6.7	81	11	85	11	13.7	2.4	8.5	0.8
E21	2.2	0.3	NQ	NQ	6.1	0.5	6.6	0.4	70	3	0.9	0.4	NQ	NQ	3.1	0.3	4.3	1.0	28	5	29	5	5.4	0.6	3.4	0.5
E22	24.3	4.8	8.3	0.5	37.6	2.2	36.8	2.4	313	21	8.7	0.5	55.2	3.3	12.9	1.3	99.5	7.1	101	9	104	10	15.2	2.9	10.2	1.7
E23	18.9	2.0	3.6	0.2	17.6	0.6	25.0	0.9	182	8	2.7	1.1	24.2	1.6	11.7	1.1	42.7	3.9	55	3	57	3	16.6	3.6	10.0	1.5
E24	8.5	1.3	4.4	0.3	23.0	1.2	23.0	1.4	233	16	4.0	0.5	30.7	3.3	8.8	0.9	51.4	5.8	115	17	119	19	14.4	2.5	9.3	1.0
E25	41.8	7.9	9.5	0.5	40.0	2.6	38.5	1.5	307	10	11.6	0.5	62.8	5.3	17.2	1.0	126.0	9.7	88	7	89	7	16.8	2.0	10.7	1.4
E26	9.7	1.8	5.4	0.2	28.2	1.2	28.2	1.6	270	13	3.7	0.7	37.5	2.0	10.9	0.6	64.2	3.2	137	8	142	8	16.0	3.3	10.5	1.4
E27	6.0	0.9	2.3	0.3	15.4	1.3	14.9	0.9	138	8	2.1	0.3	19.1	2.2	5.3	0.6	15.2	1.8	38	5	39	5	8.9	1.2	5.8	0.9
E28	28.1	2.4	11.7	1.2	44.1	4.5	43.9	2.2	403	30	11.6	1.2	66.8	7.9	28.0	1.1	185.5	9.1	216	23	226	24	27.0	3.2	17.2	0.9
E29	26.2	0.8	10.5	0.7	42.3	2.4	43.3	2.8	439	20	9.4	0.8	63.1	4.3	23.3	0.6	166.7	11.2	191	26	201	27	23.4	3.4	15.2	2.2
E30	29.4	2.0	8.1	0.4	24.5	1.4	36.1	1.3	278	13	4.3	0.6	34.2	2.8	16.8	0.7	77.5	8.6	170	16	179	20	23.8	3.0	15.3	1.4
E31	3.5	0.6	1.3	0.1	11.2	0.6	11.3	0.7	94	7	1.7	0.5	14.5	1.6	NQ	NQ	5.8	0.7	13	2	13	3	4.4	0.7	2.9	0.4
E32	21.2	2.5	6.5	0.3	29.7	1.3	33.2	0.5	272	8	4.6	0.7	44.7	2.3	12.0	0.4	62.1	5.0	91	11	96	12	14.8	1.1	10.1	0.4
E33	6.2	1.1	2.6	0.2	16.7	0.9	17.2	0.5	156	5	2.5	0.4	22.7	2.9	6.3	0.2	16.2	1.6	60	11	62	12	11.2	0.7	7.8	0.4
E34	33.2	2.5	9.9	0.5	37.6	2.1	42.9	2.9	357	10	9.6	0.8	58.0	4.0	16.8	0.9	130.0	10.5	118	9	123	10	16.9	1.4	10.8	1.0
E35	26.7	1.1	8.9	0.4	33.0	1.6	34.4	1.0	264	6	6.2	0.6	50.5	2.8	13.9	0.9	90.4	8.2	123	12	130	13	16.7	1.4	11.8	1.0
E36	9.1	1.4	3.7	0.4	19.7	1.0	21.2	1.2	199	12	2.9	0.4	28.5	2.0	10.2	0.9	35.3	5.8	111	15	114	15	14.0	1.7	9.6	1.2
E37	5.5	0.6	2.2	0.1	14.7	0.6	16.1	0.9	150	6	2.1	0.5	19.4	0.7	5.3	0.5	13.6	1.1	42	3	44	3	9.1	0.5	6.3	0.3
E38	33.5	4.6	10.5	0.4	38.5	1.5	43.2	1.9	412	15	9.9	0.9	61.8	2.4	20.4	0.9	151.1	11.5	179	16	188	18	25.8	3.9	16.7	1.5
E39	14.1	2.1	2.4	0.2	12.8	0.9	20.7	1.0	132	7	1.9	0.5	18.1	1.3	8.9	0.4	23.7	3.1	87	16	90	17	11.7	1.2	7.5	1.1
V1	19.0	3.5	7.4	0.6	30.7	1.9	35.0	2.1	291	19	5.9	0.6	47.8	3.6	14.0	1.0	68.3	3.7	108	10	113	10	15.6	1.3	9.8	1.1
V2	40.6	8.7	11.1	0.8	44.4	2.8	54.1	5.6	466	43	10.4	1.4	67.5	3.3	12.4	1.2	134.8	11.7	118	14	126	13	16.1	3.2	9.8	1.3
V3	17.3	1.9	5.5	0.2	25.4	1.5	29.3	2.8	244	21	4.6	0.7	38.2	2.5	9.7	1.4	52.8	5.5	62	7	67	7	12.6	2.0	7.5	1.0
V4	8.0	2.0	3.2	0.3	17.0	1.1	19.4	0.9	179	11	2.9	0.6	25.0	2.0	7.3	0.7	23.3	2.8	53	6	56	6	11.0	0.6	6.9	0.4
V5	4.0	0.5	2.8	0.1	11.9	0.6	13.5	0.5	134	5	1.9	0.4	17.7	1.1	3.1	0.5	19.4	1.9	45	8	48	8	4.3	0.7	2.7	0.4
V6	18.2	1.5	9.7	0.5	39.7	2.0	42.3	2.6	363	22	6.5	0.9	60.0	2.6	16.9	1.3	112.8	7.1	190	14	202	16	21.5	4.3	13.6	2.0
V7	41.2	5.4	6.3	0.5	30.8	2.2	38.7	2.3	297	17	7.3	0.7	43.6	3.4	7.5	0.4	85.4	7.4	47	5	51	5	10.6	1.5	5.6	0.6
V8	34.8	5.9	11.3	0.8	43.1	0.7	51.6	2.4	448	26	10.6	0.8	64.4	2.3	18.9	0.9	137.1	12.9	149	13	160	16	20.7	2.0	11.8	1.4
V9	32.4	4.6	10.5	0.7	39.6	1.7	47.4	1.9	384	17	11.1	0.5	63.6	3.6	15.6	0.6	127.8	10.7	119	10	125	12	18.2	2.5	10.4	1.4
R1	26.4	7.3	8.3	0.8	40.5	2.6	42.8	3.3	397	19	7.1	0.2	65.2	5.0	13.4	0.5	130.2	10.5	317	21	331	22	20.0	4.5	11.9	2.3
R2	19.3	1.8	9.2	0.5	37.3	3.1	39.0	2.3	342	27	7.7	0.3	61.2	5.4	14.1	1.0	121.3	10.8	283	25	296	25	18.4	1.4	11.7	0.5

PM3006878229

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 3: Averaged ISO Mainstream Smoke Constituent Yields

Sample Code	3-aminobiphenyl (ng/cig)		4-aminobiphenyl (ng/cig)		benzo[a]pyrene (ng/cig)		catechol (µg/cig)		m & p-cresols (µg/cig)		o-cresol (µg/cig)		hydroquinone (µg/cig)		phenol (µg/cig)		resorcinol (µg/cig)		pyridine (µg/cig)		quinoline (µg/cig)	
	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
E1	2.69	0.26	2.12	0.28	10.46	1.12	55.6	2.2	11.6	0.6	4.34	0.22	67.2	2.1	16.8	1.2	1.14	0.11	13.1	0.7	0.38	0.03
E2	1.97	0.24	1.63	0.24	6.00	0.71	30.2	1.9	5.0	0.2	1.56	0.20	28.8	2.3	6.0	0.8	0.56	0.10	5.5	0.4	0.18	0.01
E3	2.59	0.21	2.08	0.25	11.05	1.01	50.0	2.1	10.0	0.6	3.49	0.38	54.1	2.5	15.0	1.8	0.88	0.10	12.5	0.8	0.34	0.02
E4	1.16	0.11	0.97	0.05	3.32	0.33	16.9	1.1	2.0	0.2	0.75	0.11	18.3	1.2	2.0	0.6	NQ	NQ	2.6	0.6	0.09	0.01
E5	2.78	0.34	2.12	0.20	8.47	0.92	44.5	2.1	6.8	0.2	2.21	0.11	45.9	0.8	8.4	0.5	1.04	0.13	3.0	0.3	0.25	0.01
E6	0.87	0.07	0.74	0.06	1.56	0.22	6.6	0.6	0.6	0.1	NQ	NQ	6.9	0.8	NQ	NQ	BDL	BDL	1.2	0.2	0.04	0.00
E7	2.38	0.18	1.85	0.16	9.74	1.04	48.2	3.6	10.7	0.4	3.85	0.19	49.5	2.5	15.0	1.4	1.04	0.22	17.3	0.9	0.42	0.03
E8	2.18	0.15	1.70	0.15	5.34	0.55	27.0	1.1	4.5	0.3	1.51	0.11	25.5	1.2	5.8	0.6	NQ	NQ	2.4	0.4	0.17	0.01
E9	2.10	0.23	1.69	0.13	7.41	0.79	36.4	2.4	6.0	0.6	2.09	0.21	43.0	2.7	8.1	1.0	0.74	0.05	6.9	1.0	0.22	0.02
E10	2.72	0.16	2.09	0.05	8.91	0.95	50.8	3.8	12.1	0.4	4.29	0.29	57.2	2.4	17.7	2.0	1.12	0.12	13.1	0.9	0.46	0.04
E11	3.28	0.40	2.51	0.33	10.75	0.99	56.3	1.7	12.8	0.3	4.59	0.14	50.0	1.3	19.6	1.4	1.10	0.09	5.3	0.7	0.38	0.03
E12	1.71	0.20	1.26	0.13	8.92	1.36	60.1	4.5	7.4	0.4	2.92	0.24	58.6	3.8	11.6	0.9	0.82	0.15	5.1	0.5	0.22	0.02
E13	0.62	0.07	0.55	0.08	2.54	0.26	5.1	0.2	NQ	NQ	NQ	NQ	4.8	0.3	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL
E14	1.78	0.18	1.42	0.11	5.69	0.79	32.2	1.3	4.8	0.5	1.81	0.18	34.3	2.0	5.9	1.0	0.59	0.11	3.9	0.4	0.18	0.02
E15	1.34	0.06	1.01	0.13	3.55	0.38	11.7	0.9	1.2	0.1	0.36	0.02	10.8	0.7	NQ	NQ	NQ	NQ	1.1	0.2	0.03	0.00
E16	3.27	0.25	2.62	0.26	11.24	2.15	53.5	3.8	9.0	0.7	3.17	0.28	48.2	2.5	12.9	1.1	0.79	0.08	3.9	0.6	0.30	0.02
E17	3.20	0.37	2.40	0.31	11.92	1.03	54.7	1.5	11.2	0.5	4.07	0.26	50.4	1.9	16.9	0.8	0.99	0.08	13.1	1.1	0.39	0.03
E18	3.20	0.13	2.47	0.12	11.59	2.17	57.8	2.9	10.2	0.6	3.96	0.30	59.4	3.4	15.1	1.7	1.15	0.11	9.4	0.6	0.34	0.03
E19	2.08	0.28	1.61	0.23	7.12	0.69	40.1	1.5	5.8	0.2	2.22	0.12	41.1	1.6	8.4	0.5	0.94	0.06	4.4	0.6	0.19	0.01
E20	2.17	0.15	1.73	0.12	8.00	0.38	42.6	3.9	8.8	0.6	3.47	0.38	56.6	5.0	13.5	1.5	0.74	0.11	13.2	1.0	0.33	0.04
E21	0.83	0.06	0.72	0.09	2.00	0.05	5.2	0.4	NQ	NQ	NQ	NQ	5.8	0.5	BDL	BDL	BDL	BDL	0.9	0.5	NQ	NQ
E22	2.62	0.22	2.07	0.13	8.27	0.65	47.7	4.3	9.4	0.6	3.88	0.34	49.8	6.2	15.0	1.9	0.66	0.17	10.4	0.9	0.39	0.03
E23	2.23	0.21	1.67	0.10	7.02	0.80	46.4	1.4	10.2	0.9	3.78	0.31	52.0	1.2	14.2	1.0	0.90	0.06	3.2	1.1	0.31	0.04
E24	2.23	0.20	1.79	0.14	4.30	0.48	21.3	2.4	3.7	0.4	1.47	0.21	20.7	1.8	4.7	0.5	NQ	NQ	4.8	0.5	0.16	0.02
E25	2.73	0.29	2.04	0.25	12.43	1.28	54.7	3.4	12.6	0.5	4.98	0.45	64.2	5.6	19.7	3.0	1.12	0.16	15.3	0.8	0.43	0.03
E26	2.24	0.32	1.81	0.16	5.10	0.68	24.0	1.8	4.1	0.2	1.49	0.22	23.9	2.1	4.4	0.6	0.77	0.08	3.6	1.1	0.14	0.02
E27	1.40	0.13	1.13	0.14	3.12	0.40	16.8	2.2	1.9	0.2	0.67	0.12	17.6	2.3	NQ	NQ	NQ	NQ	2.0	0.3	0.10	0.01
E28	4.18	0.32	3.31	0.29	13.83	1.88	59.7	5.0	13.1	0.5	4.81	0.40	72.2	5.7	21.9	2.6	1.24	0.10	16.9	1.7	0.55	0.06
E29	3.29	0.52	2.59	0.36	9.50	1.10	47.4	4.4	10.5	1.0	3.70	0.53	47.3	4.3	13.9	1.5	0.96	0.18	13.0	1.4	0.37	0.03
E30	3.51	0.35	2.68	0.21	9.45	0.84	53.1	2.6	11.4	0.3	4.17	0.20	47.5	2.2	16.3	0.8	0.95	0.12	6.0	0.8	0.39	0.06
E31	0.84	0.12	0.51	0.09	1.50	0.12	10.3	0.9	1.0	0.1	0.42	0.07	10.4	0.7	NQ	NQ	NQ	NQ	1.2	0.5	0.03	0.01
E32	2.41	0.14	1.84	0.11	6.21	0.58	32.9	3.0	5.8	0.4	2.17	0.21	36.8	2.4	7.7	0.6	0.58	0.12	5.1	0.7	0.20	0.03
E33	1.76	0.18	1.45	0.12	3.11	0.33	18.4	0.8	2.5	0.2	0.89	0.05	17.8	0.7	2.8	0.3	NQ	NQ	2.2	0.4	0.09	0.01
E34	2.63	0.15	2.06	0.10	8.44	0.76	47.2	2.1	8.9	0.4	3.37	0.23	52.3	2.6	13.4	0.7	0.84	0.06	12.4	0.9	0.34	0.02
E35	2.64	0.21	2.14	0.18	7.46	0.66	41.1	1.9	8.3	0.6	3.16	0.32	42.1	2.1	11.3	0.8	0.90	0.09	7.5	0.6	0.26	0.02
E36	2.16	0.20	1.65	0.20	4.28	0.42	20.2	0.3	3.4	0.2	1.28	0.12	18.5	0.4	3.9	0.4	NQ	NQ	2.8	0.6	0.10	0.01
E37	1.40	0.16	1.20	0.06	2.35	0.27	16.2	0.6	1.9	0.1	0.63	0.04	16.1	0.6	2.2	0.1	NQ	NQ	2.2	0.5	0.07	0.01
E38	3.76	0.38	2.66	0.24	13.39	1.07	62.2	4.8	13.4	0.9	4.89	0.41	68.0	3.1	22.4	0.9	1.14	0.06	13.2	2.2	0.46	0.09
E39	1.85	0.16	1.44	0.18	5.20	0.47	30.1	0.8	4.9	0.4	1.80	0.19	27.5	0.7	5.9	0.8	NQ	NQ	1.9	0.4	0.14	0.04
V1	2.52	0.20	1.98	0.15	7.22	0.47	33.2	2.5	5.9	0.5	2.30	0.22	34.9	2.4	8.7	0.8	0.69	0.06	7.6	0.8	0.26	0.03
V2	2.40	0.14	1.82	0.11	12.76	1.29	73.4	5.0	13.3	0.8	5.75	0.47	75.1	3.2	23.7	2.5	0.69	0.07	12.7	2.0	0.56	0.03
V3	1.83	0.21	1.51	0.10	5.60	0.49	25.9	1.6	3.6	0.2	1.29	0.07	31.5	3.1	5.2	0.4	0.63	0.03	5.2	0.8	0.19	0.02
V4	1.67	0.04	1.35	0.07	4.31	0.42	19.4	1.5	2.7	0.2	0.99	0.06	19.6	1.2	3.8	0.3	0.55	0.09	3.3	0.8	0.14	0.01
V5	0.63	0.08	0.54	0.04	1.02	0.11	6.1	0.7	1.1	0.1	0.40	0.03	5.5	0.6	NQ	NQ	NQ	NQ	2.0	0.4	0.07	0.01
V6	2.97	0.23	2.20	0.06	9.28	0.50	34.1	1.5	4.7	0.2	1.64	0.15	34.2	2.2	6.5	0.5	0.82	0.03	7.4	1.0	0.24	0.03
V7	1.55	0.16	1.20	0.09	7.13	0.83	33.8	3.5	5.4	0.5	2.31	0.23	39.2	2.7	8.7	0.6	0.71	0.07	7.1	1.0	0.25	0.01
V8	3.16	0.20	2.43	0.15	9.67	0.56	43.1	2.2	9.1	0.5	3.54	0.34	43.9	3.0	14.8	1.5	1.11	0.04	16.2	1.9	0.50	0.03
V9	2.79	0.24	2.13	0.11	12.37	1.01	44.2	2.6	8.9	0.6	3.61	0.28	55.4	4.4	15.0	0.9	1.09	0.03	15.0	0.4	0.48	0.02
R1	2.97	0.45	2.30	0.36	7.33	1.39	40.9	2.0	8.4	0.4	3.50	0.29	39.2	1.9	11.3	0.5	0.86	0.08	8.0	0.4	0.28	0.02
R2	3.08	0.20	2.33	0.17	6.74	0.70	34.3	0.8	7.0	0.4	2.88	0.15	37.9	2.3	9.7	0.8	0.81	0.03	8.5	0.6	0.30	0.02

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001
PM3006878230

Table 3: Averaged ISO Mainstream Smoke Constituent Yields

Sample Code	NNN (2) (ng/cig)		NNK (2) (ng/cig)		NAT (2) (ng/cig)		NAB (2) (ng/cig)		mercury (ng/cig)		cadmium (ng/cig)		lead (ng/cig)		chromium (ng/cig)		nickel (ng/cig)		arsenic (ng/cig)		selenium (ng/cig)		pH	
	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
E1	78.2	7.4	52.0	5.3	71.0	5.7	10.8	1.8	3.2	0.8	46.9	3.6	23.4	1.2	NQ	NQ	BDL	BDL	NQ	NQ	BDL	BDL	6.16	0.04
E2	89.2	2.7	41.4	1.4	77.4	4.5	10.0	1.5	2.7	0.4	34.0	2.0	NQ	NQ	NQ	NQ	BDL	BDL	NQ	NQ	BDL	BDL	6.19	0.05
E3	169.4	9.8	103.9	4.4	160.4	8.8	18.6	3.4	3.1	0.1	50.9	3.4	20.1	1.4	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.17	0.05
E4	30.7	2.7	20.4	3.9	30.1	1.5	5.2	1.0	1.6	0.3	11.4	0.8	NQ	NQ	NQ	NQ	BDL	BDL	BDL	BDL	BDL	BDL	6.24	0.05
E5	147.5	10.5	75.0	3.5	129.2	9.0	18.5	2.1	2.3	0.3	17.2	1.2	21.1	1.2	NQ	NQ	BDL	BDL	NQ	NQ	BDL	BDL	6.17	0.06
E6	46.8	8.2	21.5	2.1	44.2	6.8	7.6	1.4	NQ	NQ	4.0	0.4	BDL	BDL	NQ	NQ	BDL	BDL	BDL	BDL	BDL	BDL	6.24	0.02
E7	99.6	6.8	79.5	6.5	106.9	2.1	14.5	2.5	2.9	0.4	31.3	2.4	23.3	2.2	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.13	0.04
E8	85.8	8.1	59.2	6.3	83.8	4.0	16.7	2.3	1.7	0.3	12.0	0.9	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.17	0.04
E9	58.5	5.0	37.9	6.1	54.4	6.2	9.4	1.7	2.6	0.3	30.8	2.6	15.8	1.7	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.15	0.04
E10	100.1	8.5	64.2	4.6	78.6	7.8	13.3	1.8	2.7	0.3	40.6	3.4	26.2	1.6	NQ	NQ	BDL	BDL	NQ	NQ	BDL	BDL	6.17	0.03
E11	161.2	4.1	96.2	5.9	142.8	7.2	24.7	2.4	2.4	0.4	27.6	1.0	22.8	1.3	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.14	0.04
E12	14.8	1.4	12.7	4.6	18.0	2.6	NQ	NQ	2.6	0.4	25.0	1.4	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.09	0.03
E13	43.0	3.3	18.6	3.1	40.6	3.4	7.2	1.0	BDL	BDL	2.8	0.1	BDL	BDL	NQ	NQ	BDL	BDL	BDL	BDL	BDL	BDL	6.26	0.03
E14	45.0	4.1	27.0	5.6	39.9	4.0	6.8	0.9	2.2	0.3	22.1	0.9	NQ	NQ	BDL	BDL	NQ	NQ	BDL	BDL	BDL	BDL	6.22	0.02
E15	46.6	5.8	29.5	3.5	40.3	6.7	6.6	1.4	NQ	NQ	10.2	0.7	NQ	NQ	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6.17	0.04
E16	170.8	11.0	101.3	9.5	148.2	13.8	26.2	3.4	2.6	0.3	25.6	1.0	22.2	2.1	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.13	0.04
E17	157.0	24.0	107.8	17.4	139.6	19.9	26.6	3.0	3.5	0.2	85.8	4.0	25.8	1.7	BDL	BDL	BDL	BDL	3.9	1.4	BDL	BDL	6.04	0.05
E18	126.0	6.6	78.4	8.7	106.8	7.6	17.9	3.1	3.4	0.9	50.5	2.7	22.7	1.5	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.19	0.03
E19	57.1	3.6	38.1	5.3	52.6	6.3	9.0	0.5	2.3	0.3	23.8	1.4	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.19	0.03
E20	48.1	3.9	27.7	4.9	44.1	3.0	7.2	1.2	2.7	0.4	27.4	2.9	16.8	4.0	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.09	0.04
E21	42.5	4.7	18.0	2.7	38.6	3.3	7.2	1.3	BDL	BDL	1.6	0.6	BDL	BDL	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.18	0.04
E22	52.4	5.4	37.7	2.4	50.3	4.1	9.6	1.7	2.8	0.2	31.0	2.6	18.2	0.7	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.12	0.03
E23	47.2	3.6	42.4	7.7	46.9	3.6	7.2	1.4	1.7	0.2	8.5	0.8	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.13	0.05
E24	103.5	4.0	53.9	6.6	91.2	5.0	16.3	1.6	2.0	0.2	24.6	1.2	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.23	0.06
E25	54.9	4.5	38.7	7.4	52.4	4.1	6.0	1.3	3.3	0.3	42.1	3.0	21.1	2.8	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.08	0.08
E26	95.1	4.6	55.1	4.7	88.1	5.1	16.0	1.8	2.1	0.4	35.0	4.6	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.17	0.05
E27	30.0	2.1	19.4	2.8	30.7	3.8	6.3	1.1	NQ	NQ	8.9	1.2	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.22	0.02
E28	195.3	12.0	87.3	8.2	153.3	10.0	28.5	3.7	3.6	0.2	68.3	3.2	31.4	1.6	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.13	0.08
E29	151.8	9.4	106.1	8.9	134.7	4.5	22.3	3.0	3.6	0.6	59.4	2.9	23.7	3.7	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.12	0.04
E30	145.9	7.3	87.1	4.4	136.2	8.7	15.6	1.7	2.9	0.3	31.2	1.4	23.1	2.2	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.02	0.03
E31	5.0	1.4	NQ	NQ	8.0	2.5	NQ	NQ	BDL	BDL	4.3	0.3	NQ	NQ	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6.10	0.01
E32	66.5	5.4	44.6	5.3	59.5	4.9	8.0	1.1	2.5	0.2	27.6	2.3	13.3	3.4	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.10	0.03
E33	72.1	6.7	46.1	4.6	67.2	7.4	10.1	0.7	NQ	NQ	11.2	0.7	NQ	NQ	NQ	NQ	BDL	BDL	NQ	NQ	BDL	BDL	6.13	0.02
E34	66.8	3.1	49.7	1.6	61.2	2.1	6.9	1.0	2.9	0.4	37.3	2.3	19.9	1.9	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.01	0.02
E35	70.9	6.7	57.7	7.0	63.4	6.5	7.6	1.5	2.8	0.3	39.6	3.0	17.3	1.8	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.04	0.03
E36	78.6	10.6	53.4	8.5	71.5	7.3	10.8	1.5	1.7	0.3	23.3	2.1	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.11	0.01
E37	33.5	3.1	26.9	4.3	33.9	2.7	5.3	0.8	NQ	NQ	8.7	0.7	NQ	NQ	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6.13	0.03
E38	125.4	5.7	74.2	4.3	84.6	8.9	14.1	2.3	3.3	0.5	43.3	1.5	27.6	2.5	BDL	BDL	BDL	BDL	5.5	1.2	BDL	BDL	5.99	0.02
E39	63.4	6.2	45.0	4.9	55.7	5.1	7.8	0.9	1.5	0.8	9.3	0.8	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.08	0.04
V1	142.3	5.3	90.1	8.7	120.0	4.3	15.4	2.4	2.9	0.2	32.2	3.0	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.27	0.07
V2	26.6	2.5	34.3	3.1	42.7	1.8	6.6	0.7	3.7	0.2	34.2	3.2	16.7	5.3	NQ	NQ	BDL	BDL	NQ	NQ	BDL	BDL	6.17	0.06
V3	41.1	6.7	23.7	4.1	38.3	4.0	4.3	0.8	2.7	0.4	26.8	2.9	13.0	3.3	NQ	NQ	BDL	BDL	NQ	NQ	BDL	BDL	6.21	0.05
V4	62.7	5.9	42.2	6.2	58.9	4.9	7.6	1.2	2.0	0.1	13.0	1.8	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.28	0.03
V5	38.0	6.6	19.2	3.8	37.8	5.1	6.4	1.2	1.7	0.2	5.1	0.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6.27	0.03
V6	126.9	12.7	87.4	10.3	118.6	9.5	18.9	2.6	3.7	0.2	45.6	3.6	13.9	4.0	NQ	NQ	NQ	NQ	NQ	NQ	BDL	BDL	6.15	0.04
V7	17.0	2.5	30.1	8.4	28.6	3.3	2.9	0.9	2.7	0.3	28.0	2.3	NQ	NQ	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.14	0.04
V8	116.7	5.4	47.3	1.2	97.2	3.0	13.2	1.3	4.7	0.4	101.0	11.6	21.7	1.8	BDL	BDL	BDL	BDL	4.3	1.0	BDL	BDL	6.20	0.04
V9	63.5	6.0	51.8	6.3	56.3	3.6	9.3	1.2	3.6	0.3	46.4	5.0	16.9	2.2	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	6.22	0.04
R1	106.8	4.1	75.6	8.5	117.8	7.6	25.3	3.1	5.2	0.4	68.7	1.7	39.2	1.9	BDL	BDL	BDL	BDL	4.7	1.3	BDL	BDL	5.92	0.04
R2	109.5	13.4	87.7	12.4	126.9	11.0	21.8	2.1	6.3	0.3	82.2	4.6	35.6	2.9	BDL	BDL	BDL	BDL	NQ	NQ	BDL	BDL	5.97	0.10

PM3006878231

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 4: Mainstream Smoke Constituents at the Limits of Detection (LOD) and Limits of Quantitation (LOQ)

Smoke Constituent	unit	LOD	LOQ	# of Brands at Limits
nickel	ng/cig	6.47	21.6	48
chromium	ng/cig	5.94	19.8	48
selenium	ng/cig	2.21	7.37	48
arsenic	ng/cig	1.13	3.75	45
resorcinol	µg/cig	0.158	0.526	14
crotonaldehyde	µg/cig	0.980	3.29	11
mercury	ng/cig	1.10	1.50	8
phenol	µg/cig	0.573	1.91	5
o-cresol	µg/cig	0.074	0.245	3
NAB	ng/cig	0.634	2.00	2
quinoline	µg/cig	0.007	0.024	2
m & p-cresols	µg/cig	0.153	0.509	2
acrylonitrile	µg/cig	0.282	0.939	2
toluene	µg/cig	2.50	8.32	2
NNK	ng/cig	3.72	12.4	1
ammonia	µg/cig	0.725	2.45	1
acrolein	µg/cig	0.710	2.37	1
propionaldehyde	µg/cig	1.00	3.33	1
methyl ethyl ketone	µg/cig	1.09	3.66	1
NNK	ng/cig	3.72	12.4	1
pyridine	µg/cig	0.237	0.791	1
styrene	µg/cig	0.170	0.560	1

PM3006878232

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 5: Weighted Regression of ISO Smoke Constituent Yields with ISO Tar, Nicotine or Carbon Monoxide

Constituents	With ISO Tar (weighted by 1/tar)			With ISO Nicotine (weighted by 1/nicotine)			With ISO Carbon Monoxide (weighted by 1/CO)		
	RSQ	RMSE	PRESS	RSQ	RMSE	PRESS	RSQ	RMSE	PRESS
Vapor Phase									
acetaldehyde	0.96	16.6	11852	0.93	74.6	224892	0.96	16.2	10821
acetone	0.93	10.6	4799	0.90	43.9	78289	0.93	9.9	4104
acrolein	0.93	2.1	181	0.89	9.1	3326	0.92	2.2	191
butyraldehyde	0.91	1.5	96	0.87	6.5	1711	0.90	1.6	105
crotonaldehyde	0.80	1.3	66	0.71	5.5	1208	0.75	1.4	84
methyl ethyl ketone	0.89	3.2	417	0.84	13.5	7286	0.89	3.2	421
propionaldehyde	0.94	1.9	155	0.90	8.4	2861	0.93	2.0	161
acrylonitrile	0.92	0.4	7	0.86	1.9	137	0.89	0.5	9
benzene	0.86	2.0	173	0.84	7.7	2398	0.87	2.0	155
1,3-butadiene	0.95	1.4	88	0.94	5.1	1103	0.96	1.1	54
isoprene	0.91	15.8	10270	0.90	54.5	121776	0.91	14.8	8892
styrene	0.80	0.6	14	0.72	2.5	255	0.75	0.7	18
toluene	0.87	3.1	393	0.82	12.5	6248	0.86	3.2	402
hydrogen cyanide	0.91	6.5	1730	0.87	27.1	30182	0.87	7.9	2549
nitric oxide	0.74	13.5	7476	0.75	44.7	81698	0.75	13.0	6886
nitrogen oxides	0.74	13.9	7915	0.76	45.8	85996	0.75	13.4	7323
mercury	0.91	0.10	0.4	0.88	0.4	6	0.90	0.10	0.4
Particulate Phase									
formaldehyde	0.91	1.8	126	0.84	8.1	2633	0.88	2.0	161
ammonia	0.93	0.7	23	0.93	2.7	296	0.90	0.9	34
1-aminonaphthalene	0.88	1.0	42	0.91	2.9	343	0.87	1.0	43
2-aminonaphthalene	0.86	0.7	20	0.89	2.0	165	0.85	0.7	19
3-aminobiphenyl	0.89	0.1	1	0.92	0.4	7	0.88	0.1	1
4-aminobiphenyl	0.87	0.1	1	0.90	0.3	4	0.87	0.1	1
benzo[a]pyrene	0.94	0.4	6	0.93	1.4	85	0.90	0.5	10
catechol	0.94	2.1	171	0.95	6.4	1655	0.92	2.3	215
m & p-cresols	0.96	0.4	5	0.94	1.5	95	0.90	0.6	13
o-cresol	0.94	0.2	1	0.92	0.7	18	0.88	0.2	2
hydroquinone	0.93	2.3	217	0.91	9.4	3560	0.90	2.9	330
phenol	0.92	0.8	23	0.90	3.0	377	0.85	1.1	47
resorcinol	0.80	0.1	0.2	0.83	0.2	2	0.80	0.06	0.2
pyridine	0.81	0.8	28	0.72	3.6	527	0.74	1.0	39
quinoline	0.96	0.013	0.007	0.93	0.06	0.14	0.90	0.02	0.02
NNN	0.55	12.7	6848	0.58	42.5	75736	0.54	12.9	6962
NNK	0.70	6.1	1511	0.73	20.3	16511	0.69	6.3	1570
NAT	0.55	10.7	4869	0.58	35.6	52986	0.55	10.7	4803
NAB	0.44	1.9	152	0.46	6.4	1711	0.43	1.9	152
cadmium	0.83	3.0	369	0.80	11.5	5269	0.82	3.1	393
lead	0.80	1.4	96	0.84	4.2	831	0.81	1.4	86
pH	0.26	0.03	0.03	0.29	0.09	0.34	0.28	0.03	0.03

1) RSQ = R^2 = Coefficients of determination

2) RMSE = Root mean square errors

3) PRESS = Predicted residual error sum of squares

PM3006878233

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 6: Prediction Errors using ISO Tar with Weighted Linear Regression or Transformed Variable Regression

		V1				V2				V3				V4				V5			
MS Constituents (ISO)	Units	Measured Yields		Predicted Yields	PE[3]	Measured Yields		Predicted Yields	PE[3]	Measured Yields		Predicted Yields	PE[3]	Measured Yields		Predicted Yields	PE[3]	Measured Yields		Predicted Yields	PE[3]
Vapor - ISO Tar		Average	St Dev			Average	St Dev			Average	St Dev			Average	St Dev			Average	St Dev		
acetaldehyde[1]	µg/cig	383	41	381	-2	643	40	521	-121	319	17	276	-43	147	16	189	43	***129***	***13***	***75***	***-54***
acetone[1]	µg/cig	201	17	204	3	335	18	279	-56	176	10	164	-12	97	9	124	27	87	5	70	-17
acrolein[1]	µg/cig	30.8	4.6	32.2	1.4	60.3	4.5	47.2	-13.1	27.6	1.5	24.3	-3.3	12.1	1.6	16.2	4.1	9.7	0.8	5.4	-4.3
butyraldehyde[1]	µg/cig	24.7	3.7	23.5	-1.2	***47.5***	***3.3***	***33.3***	***-14.2***	20.9	1.5	18.4	-2.6	11.4	1.2	13.1	1.7	10.2	1.6	6.1	-4.1
crotonaldehyde[1]	µg/cig	10.9	1.7	10.9	0.0	***28.3***	***2.9***	***15.9***	***-12.4***	8.9	1.1	8.2	-0.6	3.3	NQ	5.5	2.2	3.3	NQ	3.3	0.0
methyl ethyl ketone[1]	µg/cig	41.8	4.2	41.4	-0.3	78.0	6.1	59.8	-18.2	34.5	2.8	31.7	-2.8	15.9	1.7	21.8	5.9	13.4	1.1	8.7	-4.7
propionaldehyde[1]	µg/cig	32.8	3.9	33.5	0.7	56.4	3.3	48.2	-8.2	28.1	1.7	25.7	-2.4	13.8	1.6	17.8	4.0	11.8	1.1	7.3	-4.6
acrylonitrile[1]	µg/cig	7.4	0.8	6.0	-1.4	11.1	0.8	8.7	-2.5	5.5	0.2	4.6	-0.9	3.2	0.3	3.1	-0.1	***2.8***	***0.1***	***1.2***	***-1.6***
benzene[1]	µg/cig	30.7	1.9	27.9	-2.8	44.4	2.6	36.1	-8.3	25.4	1.5	22.5	-2.9	17.0	1.1	17.0	0.0	11.9	0.8	9.7	-2.3
1,3-butadiene[1]	µg/cig	35.0	2.1	31.2	-3.8	***54.1***	***5.6***	***42.9***	***-11.2***	29.3	2.6	24.9	-4.4	19.4	0.9	18.6	-0.8	13.5	0.5	10.2	-3.3
isoprene[1]	µg/cig	291	19	272	-19	466	43	368	-98	244	21	220	-24	179	11	168	-11	134	5	99	-36
styrene[1]	µg/cig	5.9	0.6	5.2	-0.7	10.4	1.4	7.6	-2.8	4.6	0.7	4.0	-0.6	2.9	0.8	2.7	-0.2	1.9	0.4	1.0	-0.8
toluene[1]	µg/cig	47.8	3.6	40.7	-7.0	67.5	3.3	56.6	-10.9	38.2	2.5	32.3	-5.9	25.0	2.0	23.8	-1.2	17.7	1.1	12.5	-5.3
hydrogen cyanide[1]	µg/cig	66.0	3.7	74.0	8.0	134.8	11.7	114.4	-20.4	52.8	5.5	53.0	0.2	23.3	2.8	31.4	8.0	19.4	1.9	2.7	-16.7
nitric oxide[2]	µg/cig	108	10	116	11	118	14	177	60	62	7	77	15	53	6	71	18	45	8	30	-15
nitrogen oxides[2]	µg/cig	113	10	120	8	126	13	184	58	67	7	80	13	56	6	74	17	48	8	31	-18
mercury[1]	ng/cig	2.8	0.2	2.4	-0.4	3.7	0.2	3.0	-0.7	***2.7***	***0.4***	***2.0***	***-0.6***	2.0	0.1	1.7	-0.3	***1.7***	***0.2***	***1.3***	***-0.4***
Particulate - ISO Tar																					
formaldehyde[1]	µg/cig	19.0	3.5	21.8	2.7	40.6	6.7	32.8	-8.0	17.3	1.9	16.0	-1.3	8.0	2.0	10.2	2.2	4.0	0.5	2.4	-1.6
ammonia[1]	µg/cig	14.0	1.0	13.2	-0.8	***12.4***	***1.2***	***18.7***	***6.3***	9.7	1.4	10.3	0.6	7.3	0.7	7.4	0.0	3.1	0.5	3.4	0.3
1-aminonaphthalene[1]	ng/cig	15.6	1.3	15.1	-0.5	18.1	3.2	20.4	2.3	12.6	2.0	12.3	-0.4	11.0	0.8	9.4	-1.6	4.3	0.7	5.6	1.3
2-aminonaphthalene[1]	ng/cig	9.8	1.1	9.6	-0.2	9.8	1.3	12.9	3.1	7.5	1.0	7.9	0.3	6.9	0.4	6.1	-0.8	2.7	0.4	3.7	1.1
3-aminobiphenyl[1]	ng/cig	2.52	0.20	2.28	-0.24	2.40	0.14	3.06	0.66	1.83	0.21	1.87	0.03	1.67	0.04	1.45	-0.23	0.63	0.08	0.89	0.26
4-aminobiphenyl[1]	ng/cig	1.98	0.15	1.79	-0.19	1.82	0.11	2.37	0.55	1.51	0.10	1.48	-0.03	1.35	0.07	1.17	-0.19	0.54	0.04	0.75	0.21
benzo[a]pyrene[1]	ng/cig	7.22	0.47	7.23	0.01	12.76	1.29	10.15	-2.61	5.60	0.49	5.68	0.08	4.31	0.42	4.11	-0.20	1.02	0.11	2.02	1.00
catechol[1]	µg/cig	39.2	2.5	37.0	-3.8	***73.4***	***6.0***	***53.1***	***-20.3***	25.9	1.6	28.4	2.5	19.4	1.5	19.7	0.3	6.1	0.7	8.1	2.0
m & p-cresols[1]	µg/cig	5.9	0.5	6.9	1.0	***13.3***	***0.8***	***10.4***	***-2.8***	3.6	0.2	5.1	1.5	2.7	0.2	3.2	0.5	1.1	0.1	0.7	-0.4
o-cresol[1]	µg/cig	2.30	0.22	2.55	0.25	***5.75***	***0.47***	***3.83***	***-1.91***	1.29	0.07	1.87	0.58	0.99	0.06	1.18	0.19	0.40	0.03	0.26	-0.13
hydroquinone[1]	µg/cig	34.9	2.4	36.7	3.7	***75.1***	***3.2***	***55.9***	***-19.2***	31.5	3.1	29.5	-1.9	19.6	1.2	20.2	0.6	5.5	0.6	7.9	2.4
phenol[1]	µg/cig	8.7	0.8	10.0	1.3	***23.7***	***2.5***	***15.2***	***-8.5***	5.2	0.4	7.2	2.0	3.6	0.3	4.4	0.7	1.9	NQ	1.9	0.0
resorcinol[1]	µg/cig	0.89	0.06	0.76	0.06	0.89	0.07	1.02	0.33	0.63	0.03	0.62	-0.01	0.55	0.09	0.48	-0.06	0.53	NQ	0.53	0.00
pyridine[1]	µg/cig	7.6	0.6	6.8	-0.8	12.7	2.0	10.2	-2.5	5.2	0.8	5.0	-0.2	3.3	0.8	3.1	-0.2	2.0	0.4	0.7	-1.2
quinoline[1]	µg/cig	0.26	0.03	0.24	-0.02	***0.58***	***0.03***	***0.37***	***-0.19***	0.19	0.02	0.18	-0.01	0.14	0.01	0.11	-0.03	0.07	0.01	0.02	-0.04
NNN[2]	ng/cig	142.3	6.3	124.7	-17.6	26.6	2.5	39.0	12.4	41.1	6.7	42.7	1.5	62.7	5.9	53.2	-9.5	38.0	6.6	31.6	-6.4
NNK[2]	ng/cig	90.1	8.7	70.5	-19.6	34.3	3.1	58.3	24.0	23.7	4.1	24.9	1.2	42.2	6.2	40.2	-2.0	19.2	3.8	21.6	2.4
NAT[2]	ng/cig	120.0	4.3	108.9	-11.1	42.7	1.8	56.6	13.9	38.3	4.0	39.9	1.5	58.9	4.9	48.6	-10.3	37.8	5.1	28.5	-9.3
NAB[2]	ng/cig	15.4	2.4	13.9	-1.5	6.6	0.7	13.4	6.9	4.3	0.8	8.4	4.2	7.6	1.2	8.6	1.0	6.4	1.2	5.7	-0.8
cadmium[1]	ng/cig	32.2	3.0	27.7	-4.5	34.2	3.2	40.9	6.7	26.8	2.9	20.7	-6.1	13.0	1.8	13.5	0.5	5.1	0.7	4.1	-1.1
lead[1]	ng/cig	12.8	NQ	16.6	3.8	16.7	5.3	22.2	5.5	13.0	3.3	13.6	0.6	12.8	NQ	12.8	0.0	3.9	BDL	3.9	0.0

1. WLS = Weighted least square (1/Tar)
2. With transformed variables - see Figures 4 and 5
3. Prediction Error (PE) = Predicted yields - Measured yields
   -PE = under predicted (measured yield above line)
   +PE = over predicted (measured yield below line)

Yields in bold are outside of the 95% predicted interval.
When predicted yield < LOQ and > LOD, LOQ is reported.
When predicted yield < LOD, LOD is reported.

increase raw weight to 14.25

PM3006878234

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 6: Prediction Errors using ISO Tar with Weighted Linear Regression or Transformed Variable Regression

		V6				V7				V8				V9			
MS Constituents (ISO)	Units	Measured Yields		Predicted Yields	PE[3]	Measured Yields		Predicted Yields	PE[3]	Measured Yields		Predicted Yields	PE[3]	Measured Yields		Predicted Yields	PE[3]
Vapor - ISO Tar		Average	St Dev			Average	St Dev			Average	St Dev			Average	St Dev		
acetaldehyde[1]	µg/cig	461	61	411	-50	396	31	323	-73	520	49	559	39	527	64	515	-12
acetone[1]	µg/cig	262	30	227	-34	224	15	186	-38	298	26	297	-2	288	25	276	-12
acrolein[1]	µg/cig	42.6	6.4	37.0	-5.6	39.9	3.2	28.7	-11.2	50.7	5.3	50.8	0.0	47.7	6.4	46.6	-1.1
butyraldehyde[1]	µg/cig	33.1	4.2	26.6	-6.5	27.0	1.6	21.2	-5.8	35.7	3.2	35.6	-0.1	36.9	4.7	32.9	-4.1
crotonaldehyde[1]	µg/cig	15.8	2.6	12.4	3.4	16.5	1.9	9.7	-6.8	22.8	2.8	17.0	-5.8	22.8	3.0	15.7	-7.2
methyl ethyl ketone[1]	µg/cig	53.9	6.1	47.2	-6.7	48.4	3.5	37.1	-11.3	62.8	6.4	64.1	1.3	64.2	5.4	59.0	-5.2
propionaldehyde[1]	µg/cig	42.6	4.5	38.1	-4.4	35.4	2.6	30.0	-5.4	47.8	4.3	51.7	3.9	48.0	5.4	47.6	-0.4
acrylonitrile[1]	µg/cig	***9.7***	***0.5***	***6.8***	***-2.9***	6.3	0.5	5.4	-1.0	11.3	0.6	9.3	-2.0	10.5	0.7	8.6	-2.0
benzene[1]	µg/cig	39.7	2.0	31.1	-8.5	30.8	2.2	25.5	-5.3	43.1	0.7	40.5	-2.6	39.6	1.7	37.7	-1.9
1,3-butadiene[1]	µg/cig	42.3	2.6	34.9	-7.5	***38.7***	***2.3***	***28.4***	***-10.4***	51.6	2.4	45.7	-5.9	47.4	1.9	42.4	-5.0
isoprene[1]	µg/cig	383	22	302	-81	297	17	248	-48	448	26	391	-57	364	17	364	0
styrene[1]	µg/cig	6.5	0.9	6.0	-0.5	7.3	0.7	4.7	-2.6	10.8	0.8	8.2	-2.4	11.1	0.5	7.5	-3.6
toluene[1]	µg/cig	60.0	2.6	45.7	-14.3	43.8	3.4	37.0	-6.8	64.4	2.3	60.3	-4.1	63.6	3.6	55.9	-7.7
hydrogen cyanide[1]	µg/cig	112.8	7.1	87.0	-25.0	66.4	7.1	64.7	0.7	137.1	12.9	123.9	-13.2	127.8	10.7	112.7	-15.0
nitric oxide[2]	µg/cig	190	14	167	-23	47	5	70	23	149	13	153	4	119	10	143	24
nitrogen oxides[2]	µg/cig	202	16	173	-29	51	5	72	21	160	16	159	-1	125	12	148	23
mercury[1]	ng/cig	***3.7***	***0.2***	***2.6***	***-1.1***	2.7	0.3	2.2	-0.5	***4.7***	***0.4***	***3.1***	***-1.5***	3.6	0.3	3.0	-0.6
Particulate - ISO Tar																	
formaldehyde[1]	µg/cig	18.2	1.5	26.2	7.0	***41.2***	***5.4***	***19.2***	***-22.0***	34.8	5.9	35.2	0.4	32.4	4.8	32.2	-0.2
ammonia[1]	µg/cig	16.9	1.3	15.0	-2.0	***7.5***	***0.4***	***11.9***	***4.4***	18.9	0.9	20.0	1.1	15.6	0.6	18.5	2.8
1-aminonaphthalene[1]	ng/cig	21.5	4.3	16.8	-4.7	10.6	1.5	13.8	3.3	20.7	2.0	21.7	1.0	18.2	2.5	20.2	2.0
2-aminonaphthalene[1]	ng/cig	13.6	2.0	10.7	-2.9	5.6	0.6	8.8	3.2	11.8	1.4	13.7	1.9	10.4	1.4	12.8	2.4
3-aminobiphenyl[1]	ng/cig	2.97	0.23	2.53	-0.44	1.56	0.16	2.09	0.54	3.16	0.20	3.24	0.08	2.79	0.24	3.03	0.24
4-aminobiphenyl[1]	ng/cig	2.20	0.06	1.97	-0.23	1.20	0.09	1.65	0.45	2.43	0.15	2.51	0.08	2.13	0.11	2.35	0.22
benzo[a]pyrene[1]	ng/cig	9.28	0.50	8.15	-1.13	7.13	0.83	6.54	-0.60	9.67	0.56	10.84	1.17	12.37	1.01	10.03	-2.33
catechol[1]	µg/cig	34.1	1.5	42.1	7.9	33.8	3.5	33.1	-0.7	43.1	2.2	57.0	13.9	44.2	2.6	52.5	8.3
m & p-cresols[1]	µg/cig	***4.7***	***0.2***	***8.0***	***3.3***	5.4	0.5	6.1	0.7	9.1	0.5	11.3	2.2	8.9	0.6	10.3	1.4
o-cresol[1]	µg/cig	***1.64***	***0.15***	***2.96***	***1.32***	2.31	0.23	2.25	-0.06	3.54	0.34	4.13	0.59	3.61	0.28	3.78	0.17
hydroquinone[1]	µg/cig	34.2	2.2	44.1	9.9	39.2	2.7	34.6	-4.6	43.9	3.0	60.0	16.0	55.4	4.4	55.2	-0.2
phenol[1]	µg/cig	***5.5***	***0.5***	***11.6***	***5.1***	8.7	0.6	8.7	0.0	14.8	1.5	16.4	1.7	15.0	0.9	15.0	0.0
resorcinol[1]	µg/cig	0.82	0.03	0.84	0.02	0.71	0.07	0.70	-0.02	1.11	0.04	1.08	-0.04	1.09	0.03	1.01	-0.09
pyridine[1]	µg/cig	7.4	1.0	7.8	0.4	7.1	1.0	6.0	-1.1	16.2	1.9	11.0	-5.2	15.0	0.4	10.0	-4.9
quinoline[1]	µg/cig	0.24	0.03	0.28	0.04	0.25	0.01	0.21	-0.04	0.50	0.03	0.40	-0.10	***0.48***	***0.02***	***0.36***	***-0.12***
NNN[2]	ng/cig	126.9	12.7	118.4	10.5	17.0	2.5	20.4	3.4	118.7	5.4	116.5	-1.2	63.5	6.0	83.0	19.5
NNK[2]	ng/cig	87.4	10.3	82.0	-5.4	30.1	8.4	35.2	5.2	47.3	1.2	70.8	23.5	51.8	6.3	49.4	-2.3
NAT[2]	ng/cig	118.6	9.5	100.5	-18.1	26.6	3.3	34.6	6.0	97.2	3.0	95.2	-2.0	56.3	3.6	73.1	16.8
NAB[2]	ng/cig	18.9	2.6	13.5	-5.4	2.9	0.9	9.0	6.2	13.2	1.3	12.9	-0.3	9.3	1.2	14.8	5.6
cadmium[1]	ng/cig	45.6	3.6	31.9	-13.7	28.0	2.3	24.6	-3.5	***101.0***	***11.6***	***44.1***	***-56.9***	45.4	5.0	40.4	-5.0
lead[1]	ng/cig	13.9	4.0	18.3	4.5	12.8	NQ	15.2	2.4	21.7	1.6	23.5	1.8	16.9	2.2	22.0	5.1

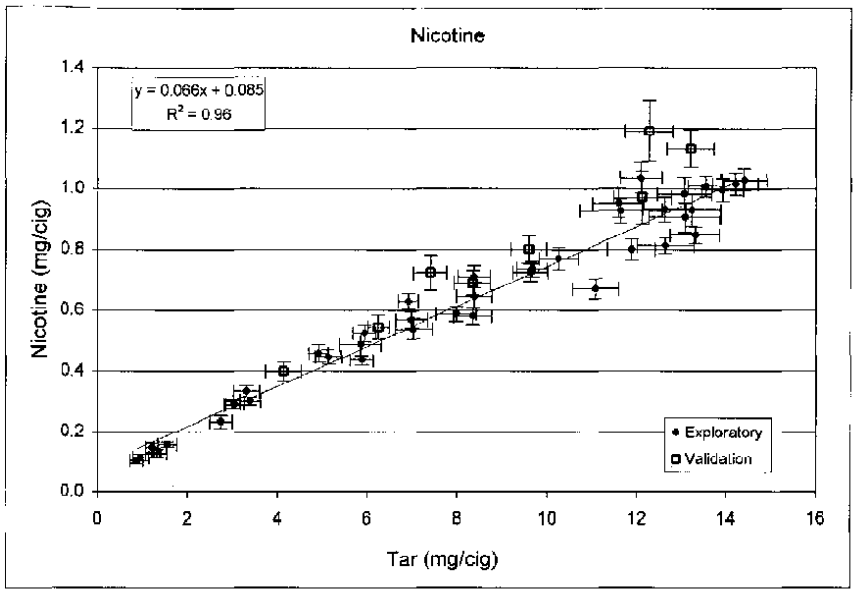
1. WLS = Weighted least square (1/Tar)
2. With transformed variables - see Figures 4 and 5
3. Prediction Error (PE) = Predicted yields - Measured yields
   -PE = under predicted (measured yield above line)
   +PE = over predicted (measured yield below line)

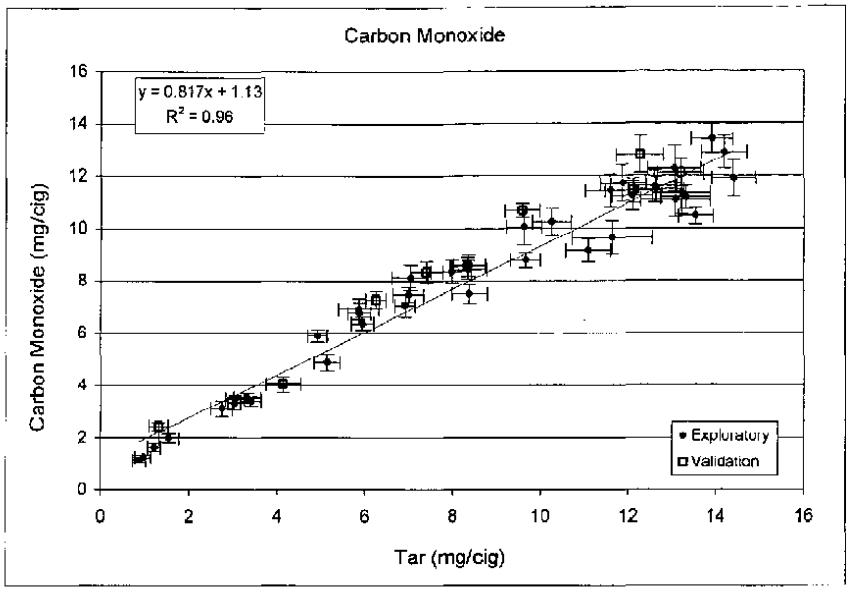
Yields in bold are outside of the 95% predicted interval.
When predicted yield < LOQ and > LOD, LOQ is reported.
When predicted yield < LOD, LOD is reported.

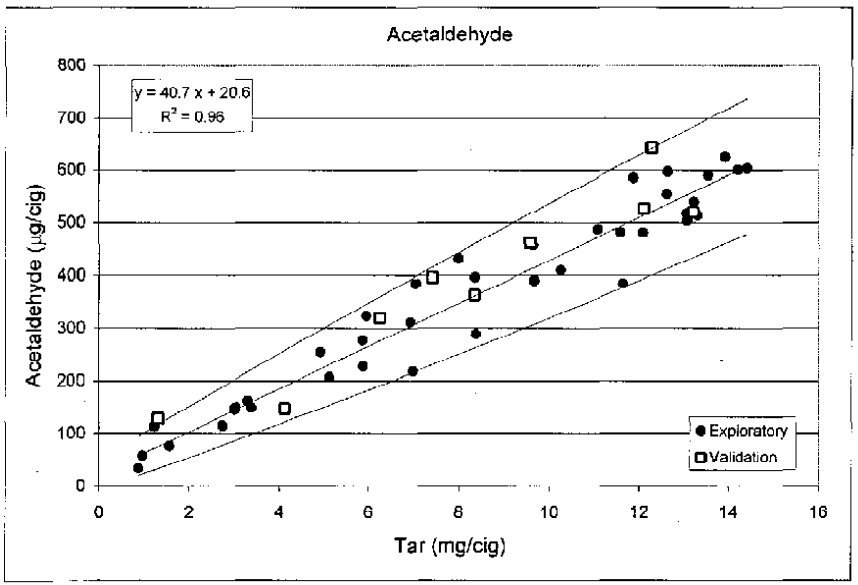
PM3006878235

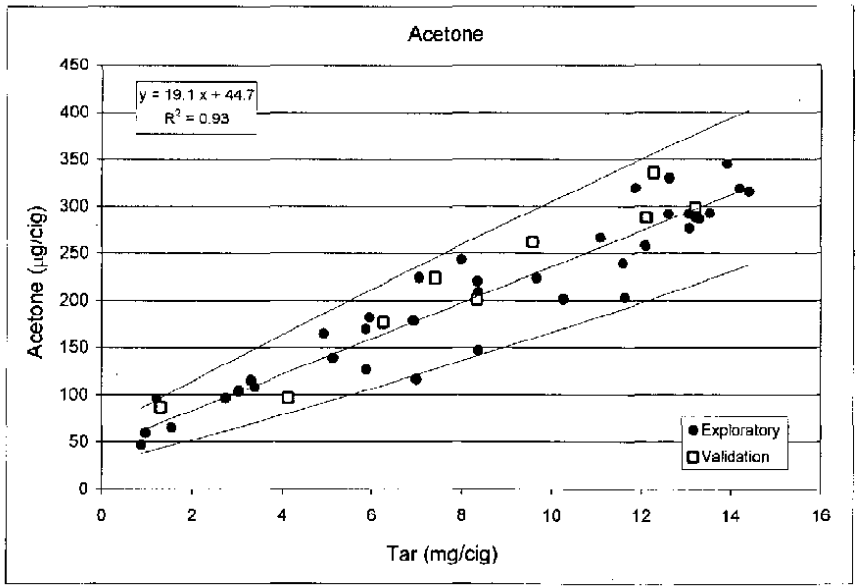
Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression with 1/tar Weighting





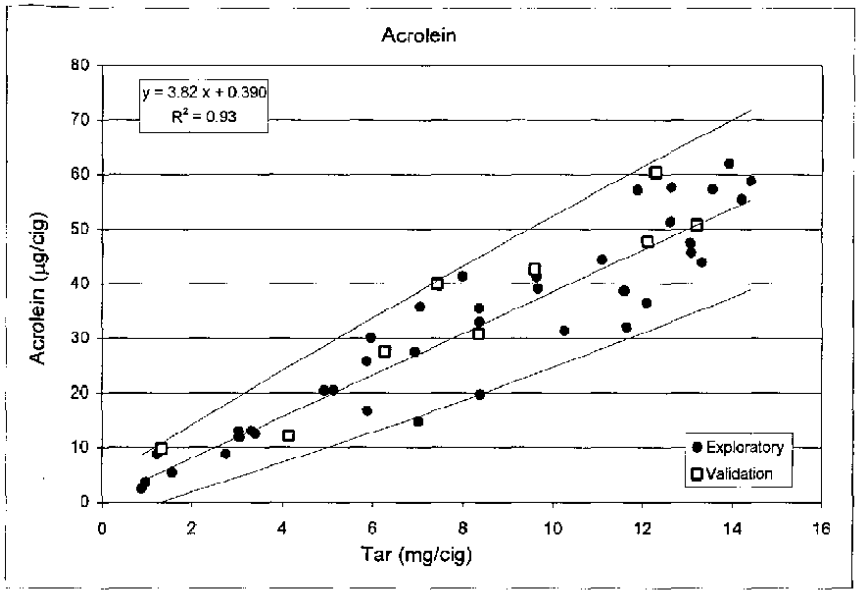


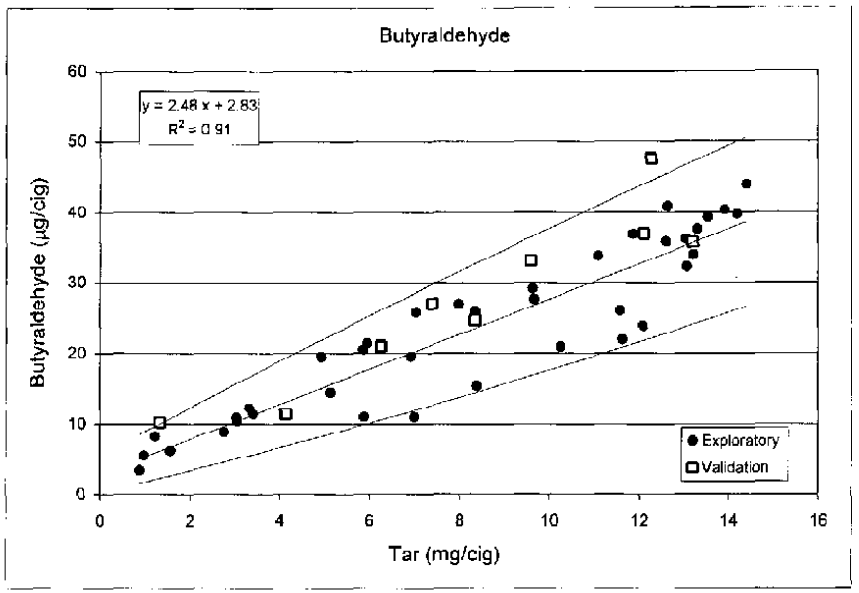


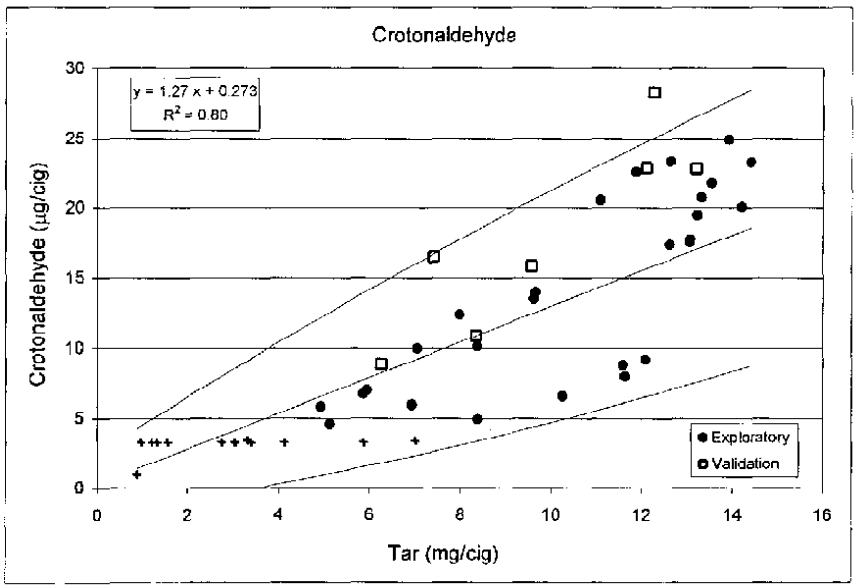
PM3006878236

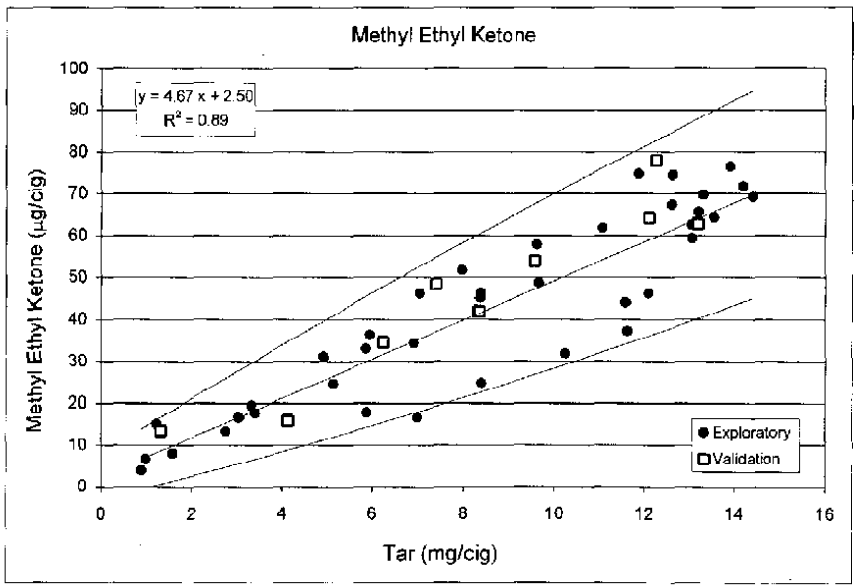
Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression from 1/tar Weighting





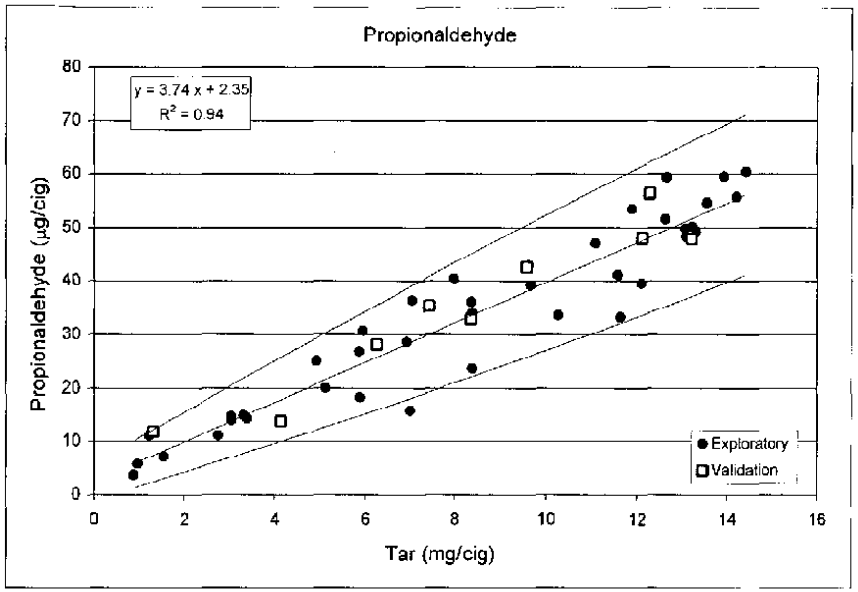


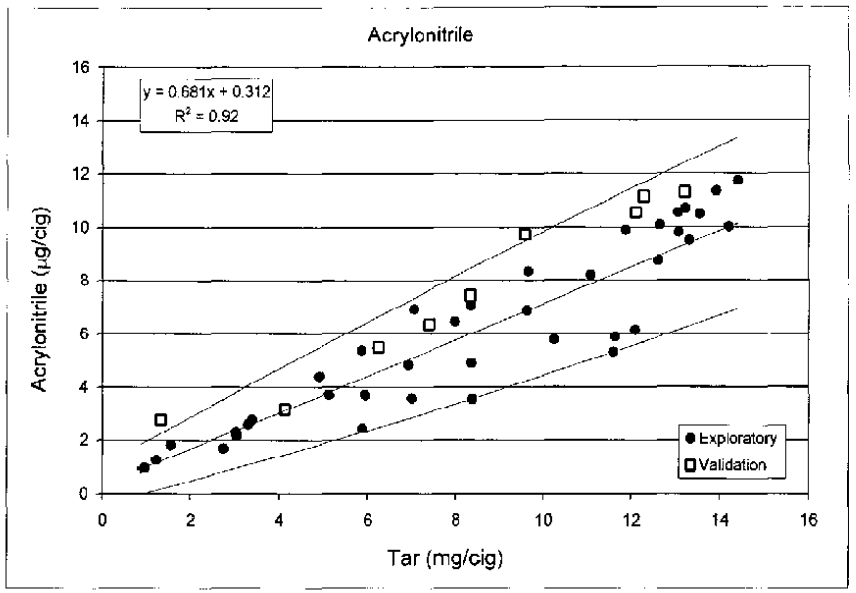


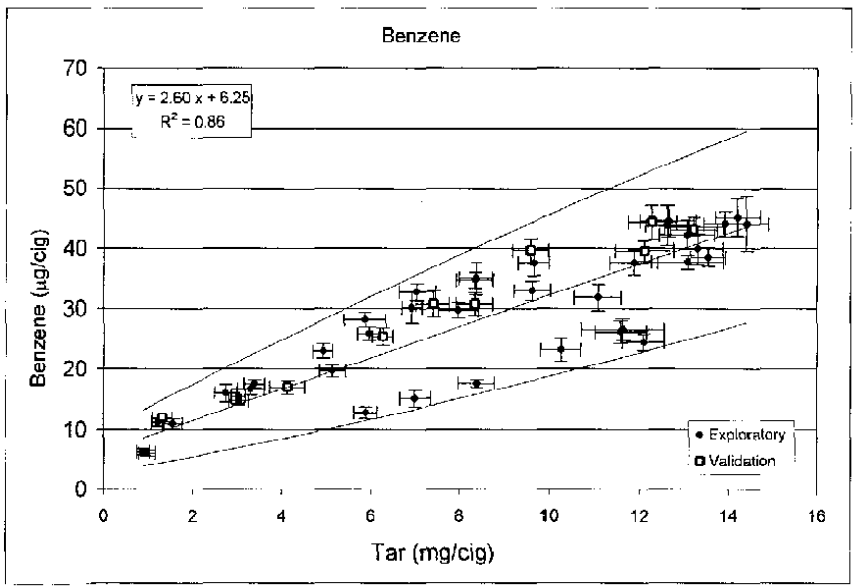
PM3006878237

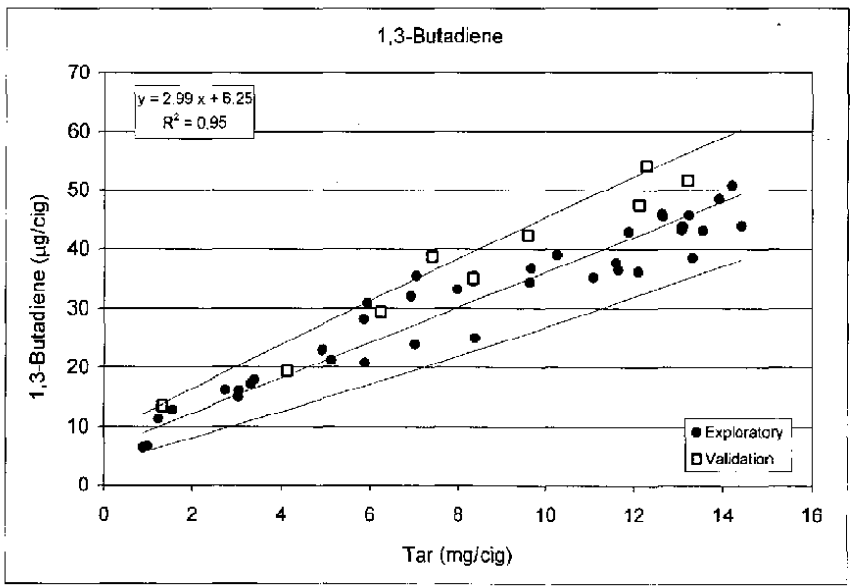
Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression PLots from Weighted Linear Regression with 1/tar Weighting





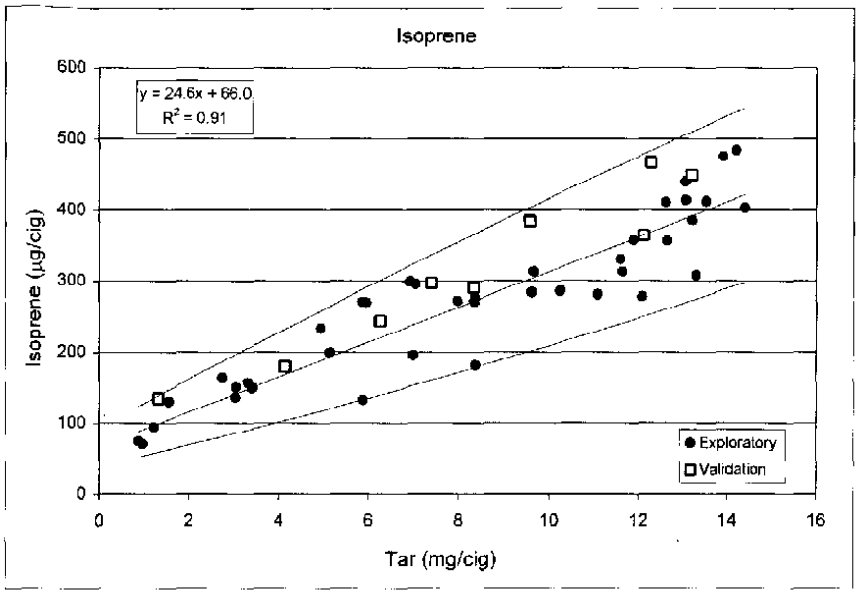


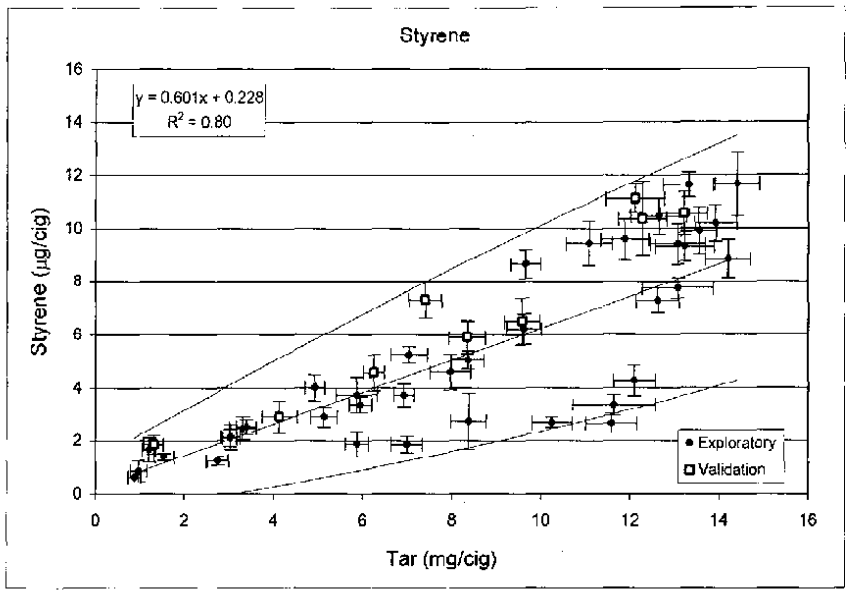


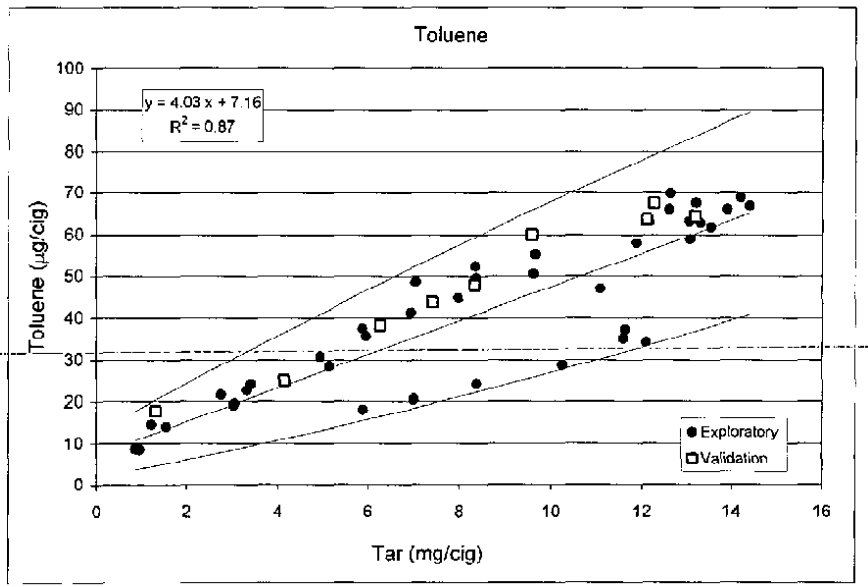
PM3006878238

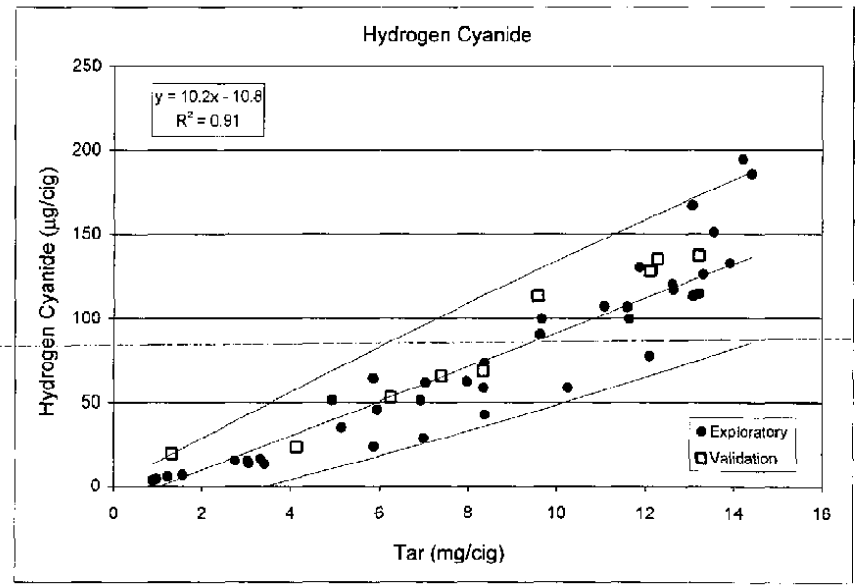
Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression with 1/tar Weighting





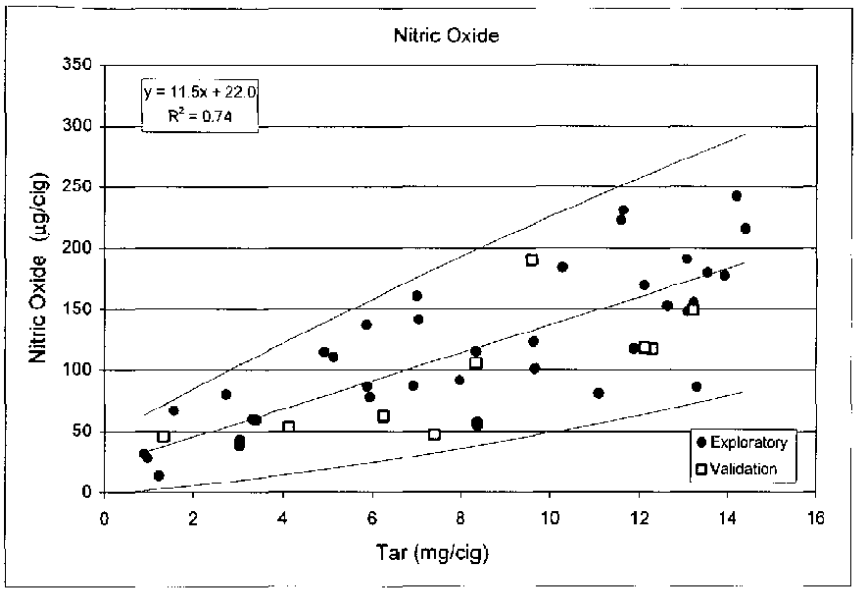


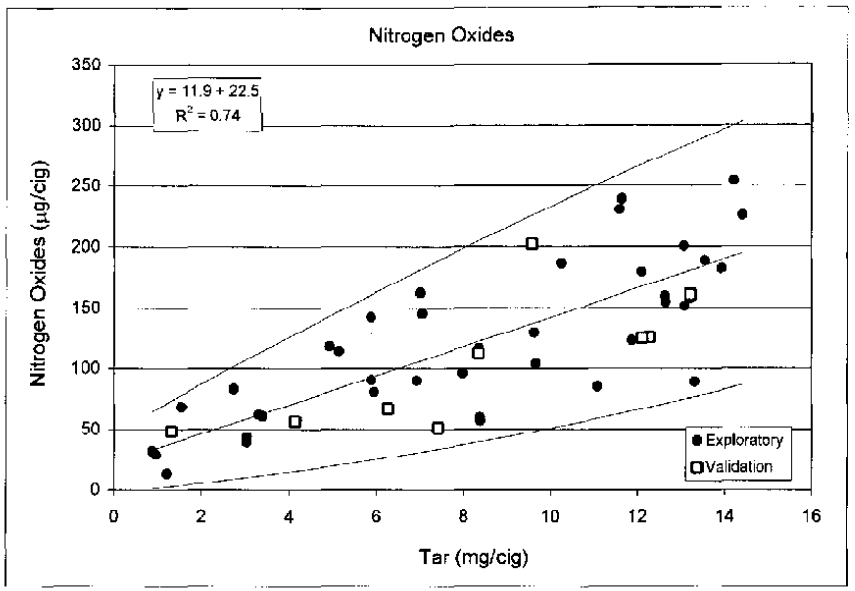


PM3006878239

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression with 1/tar Weighting

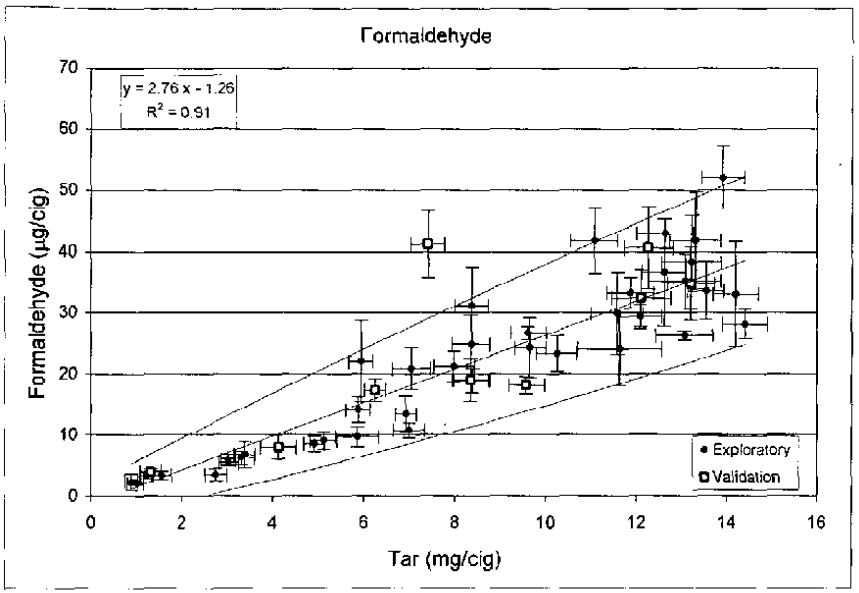


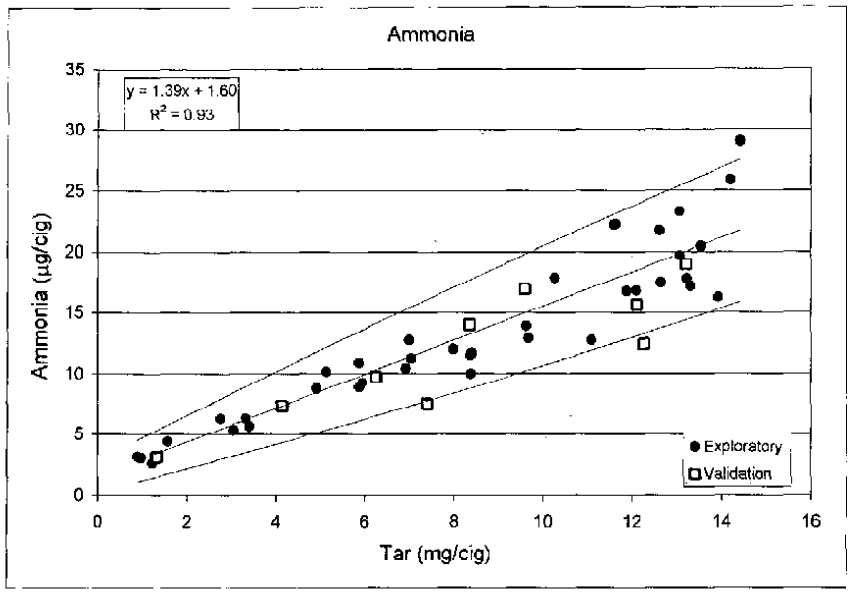


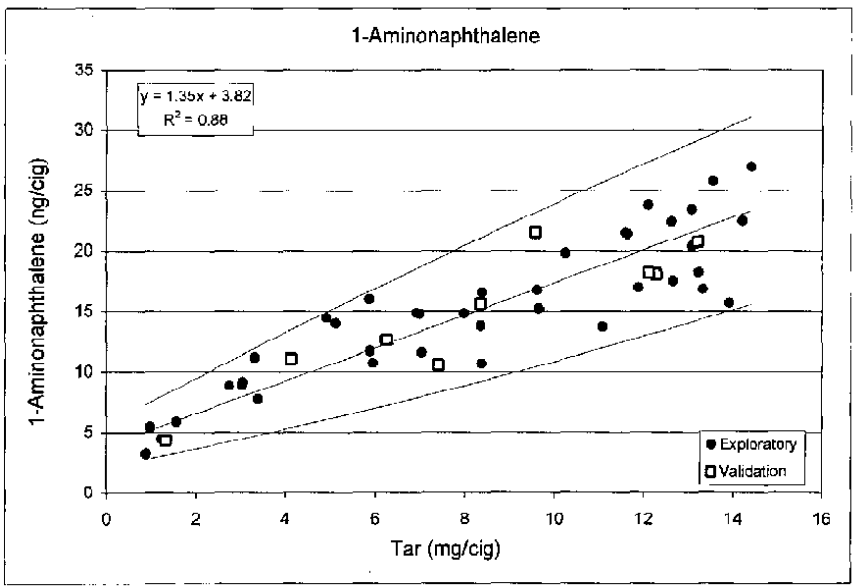
PM3006878240

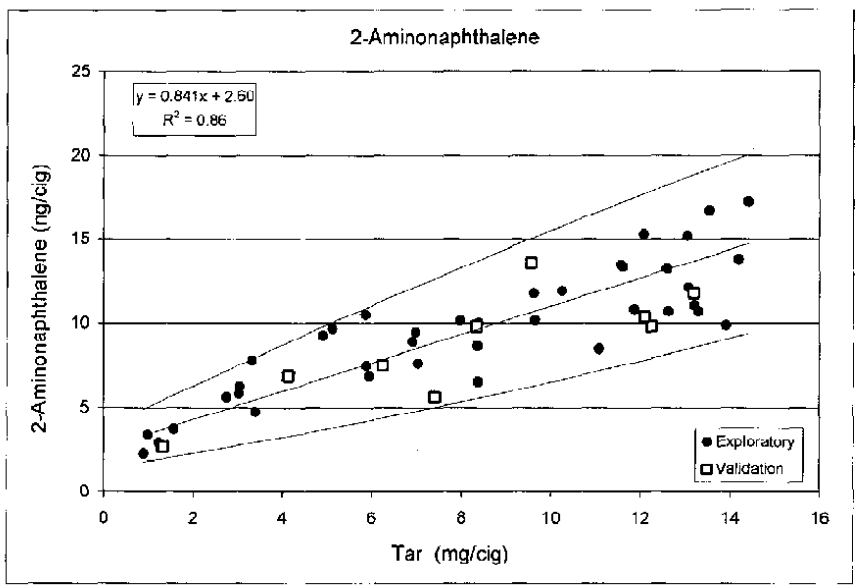
Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression with 1/tar Weighting





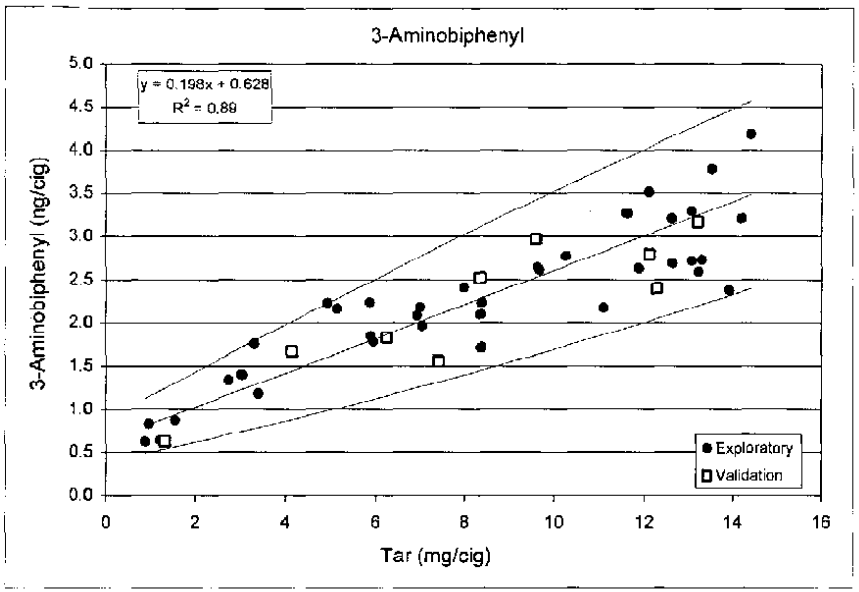


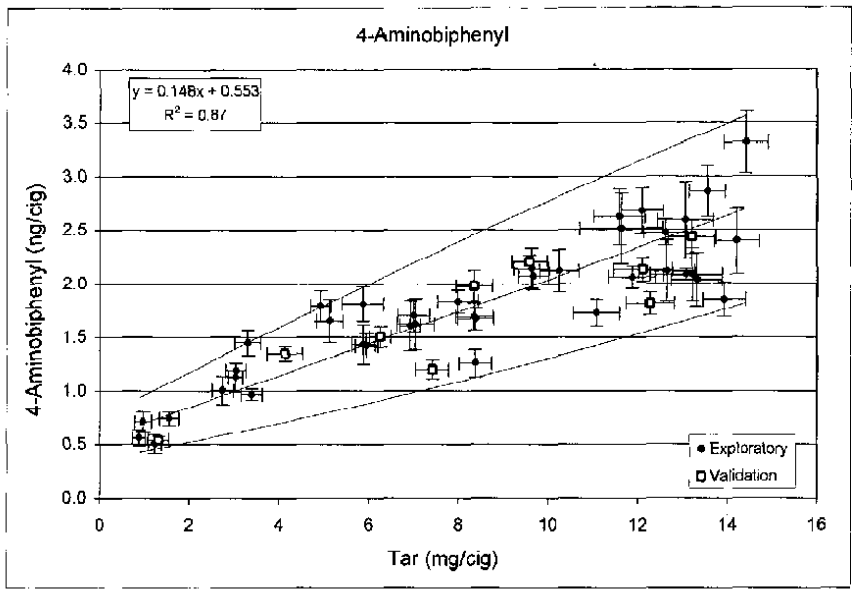


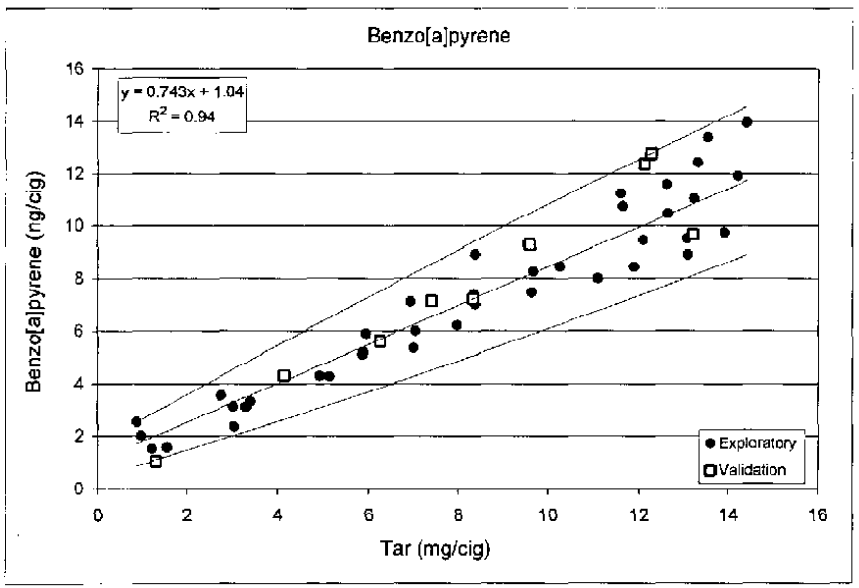
PM3006878241

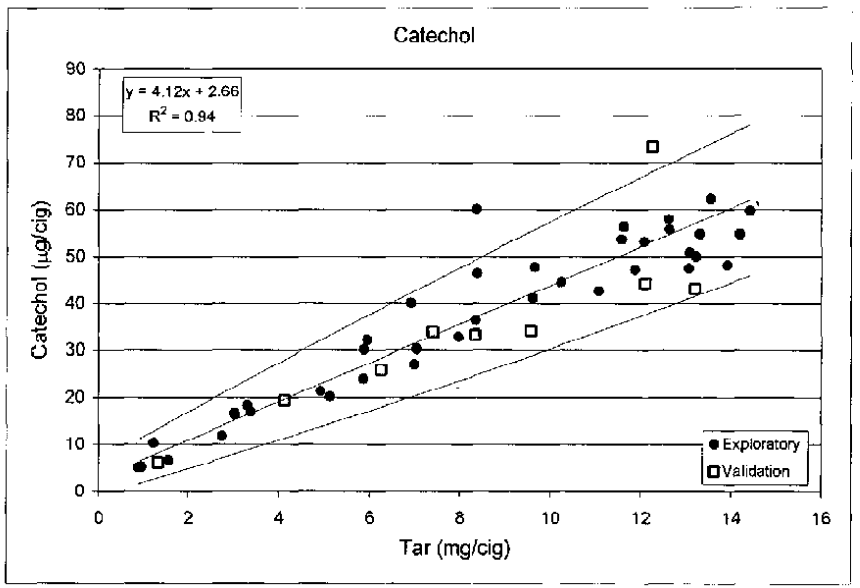
Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression with 1/tar Weighting





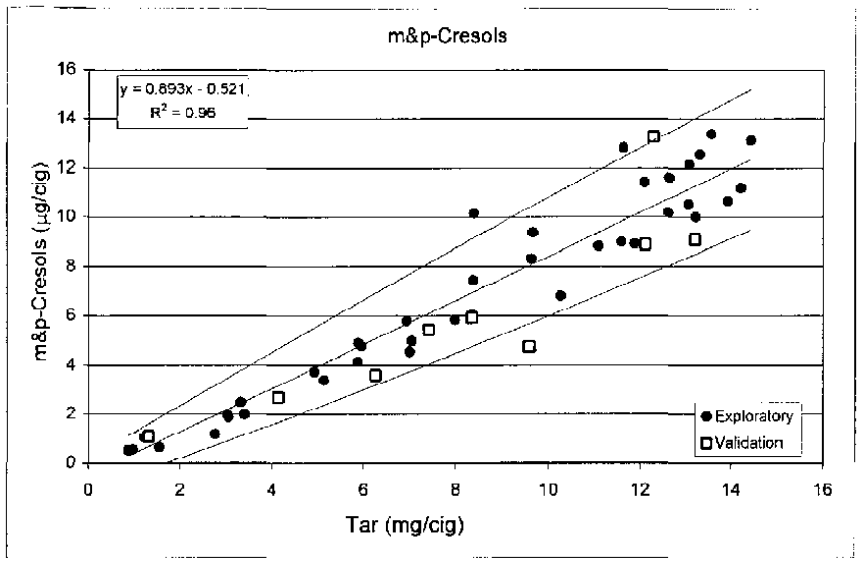


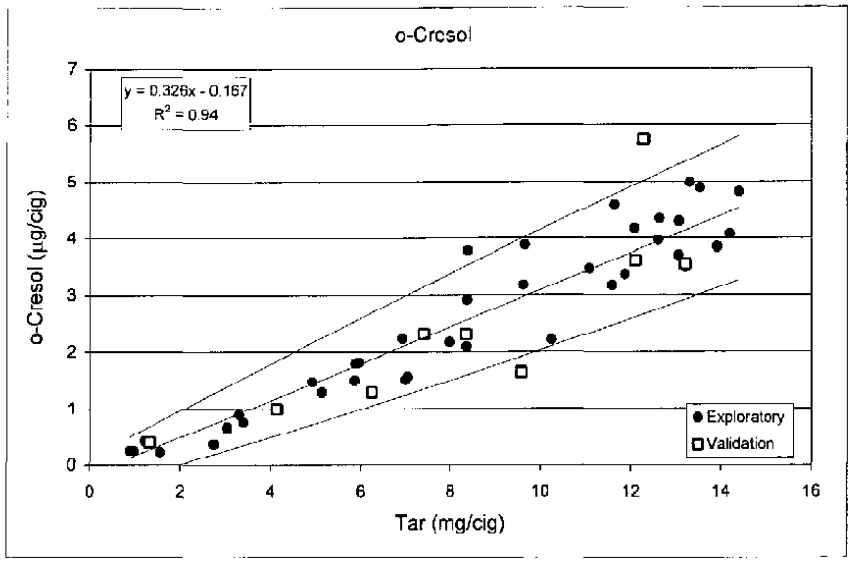


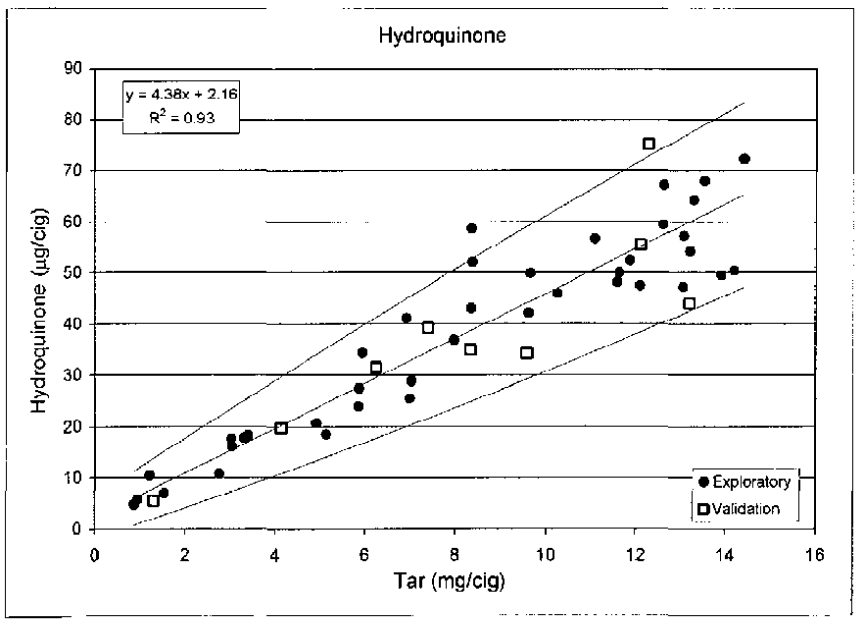
PM3006878242

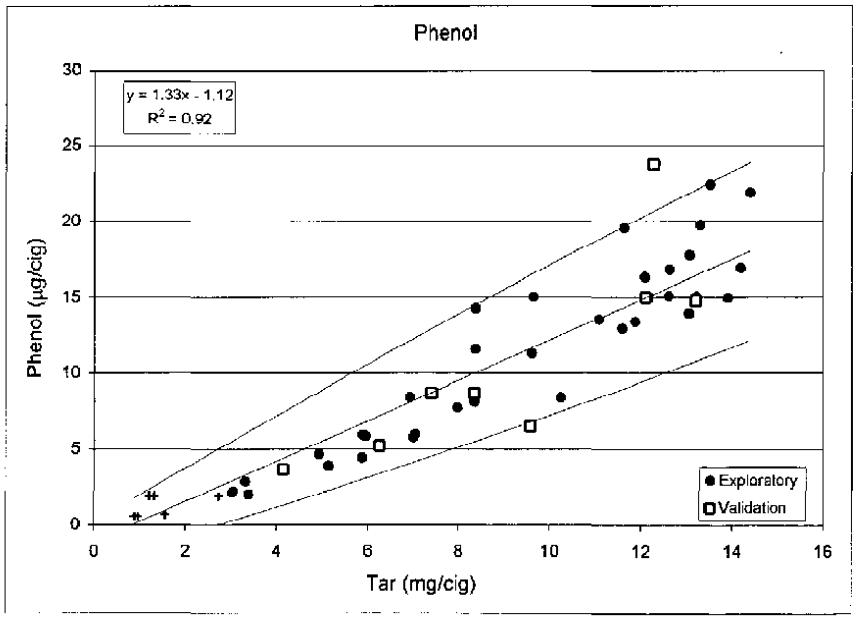
Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression with 1/tar Weighting





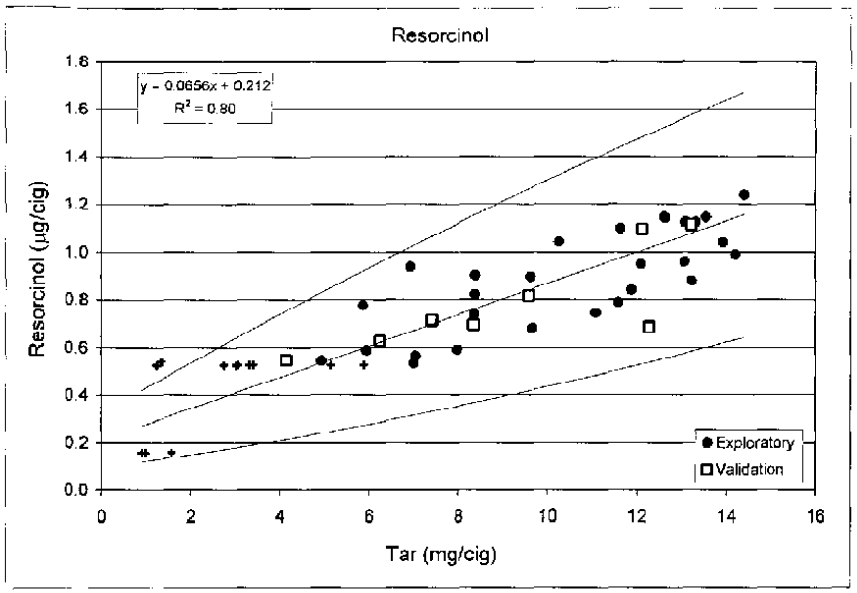


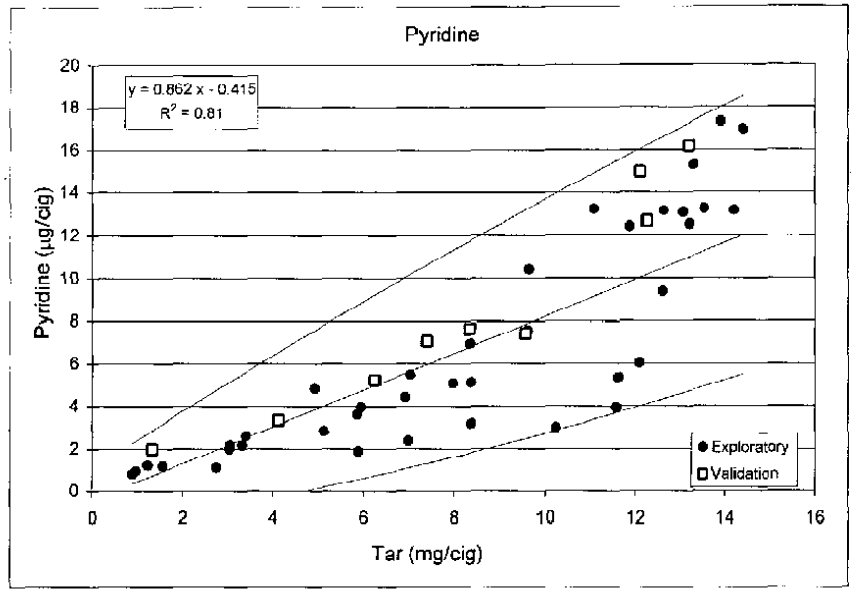


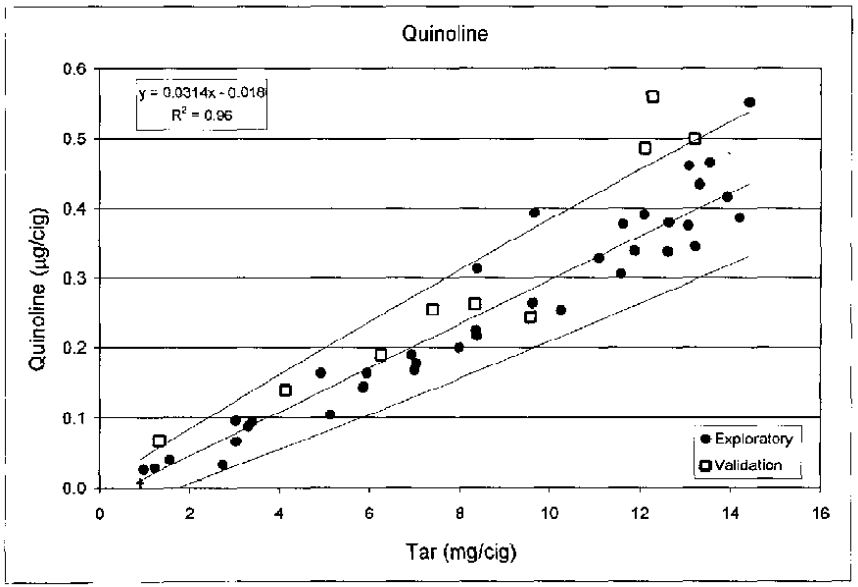
PM3006878243

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression with 1/tar Weighting



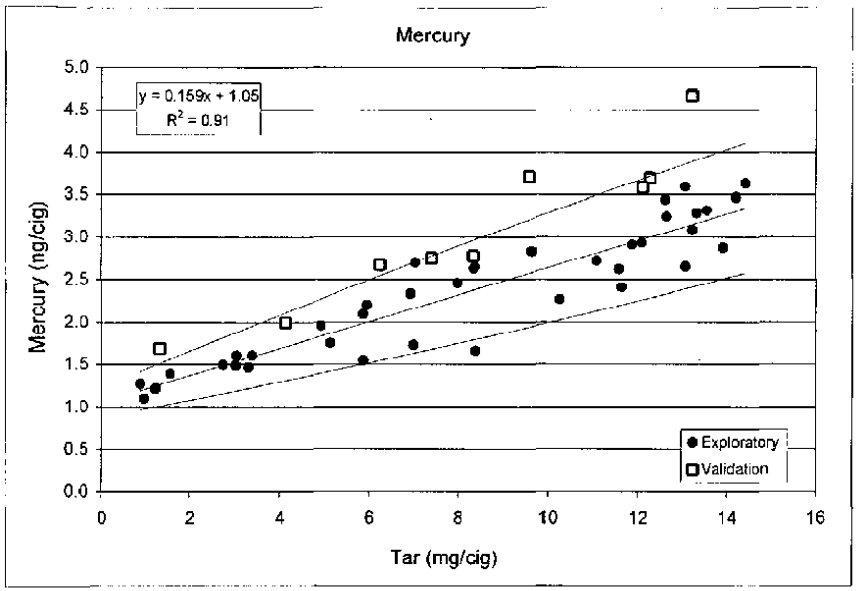


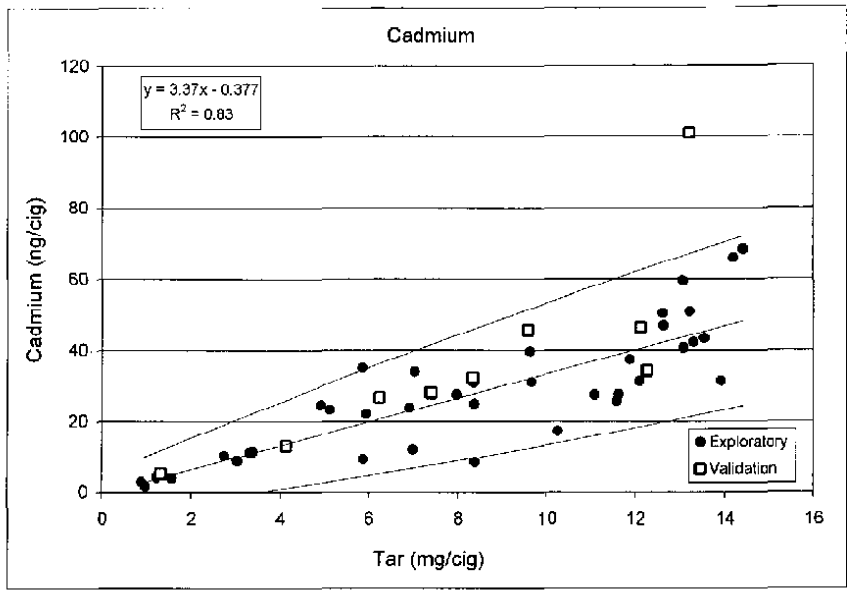


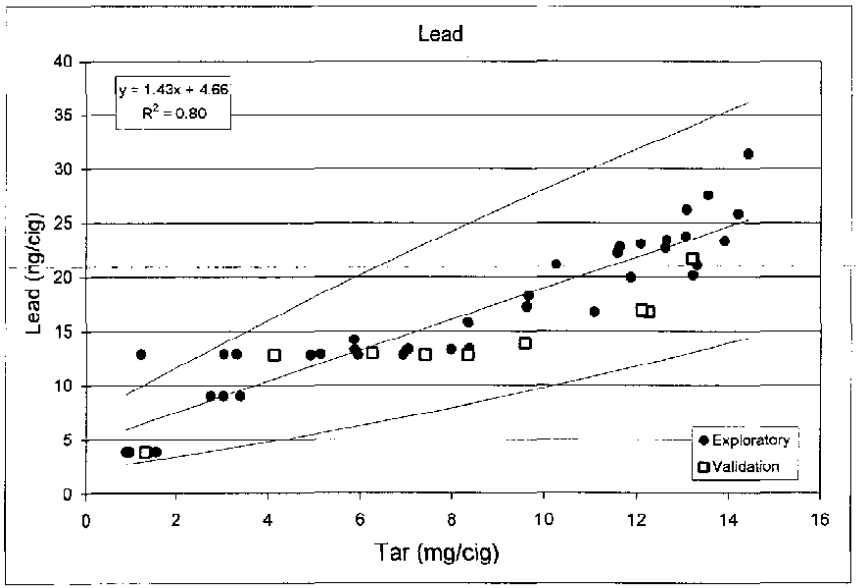
PM3006878244

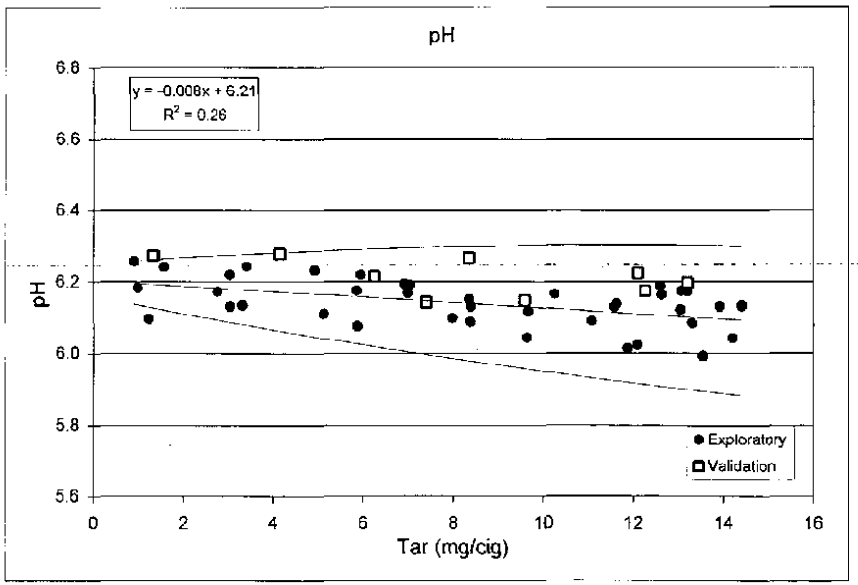
Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression with 1/tar Weighting





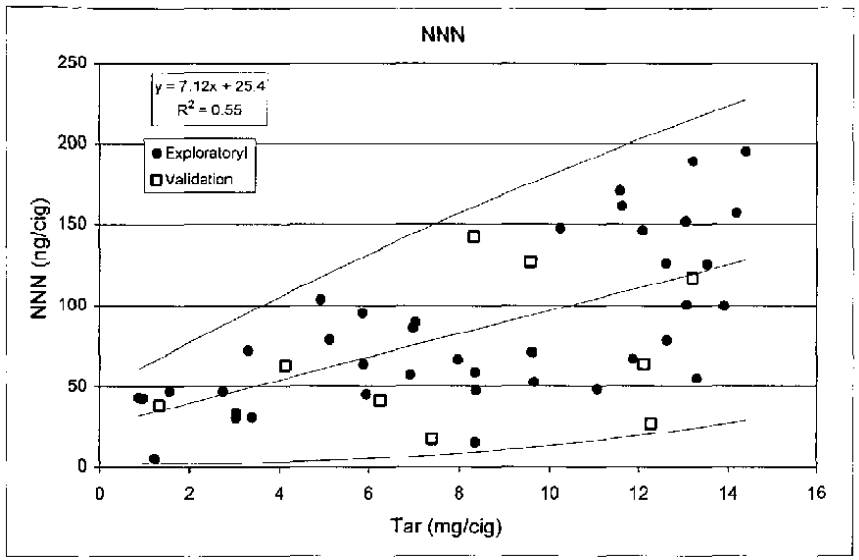


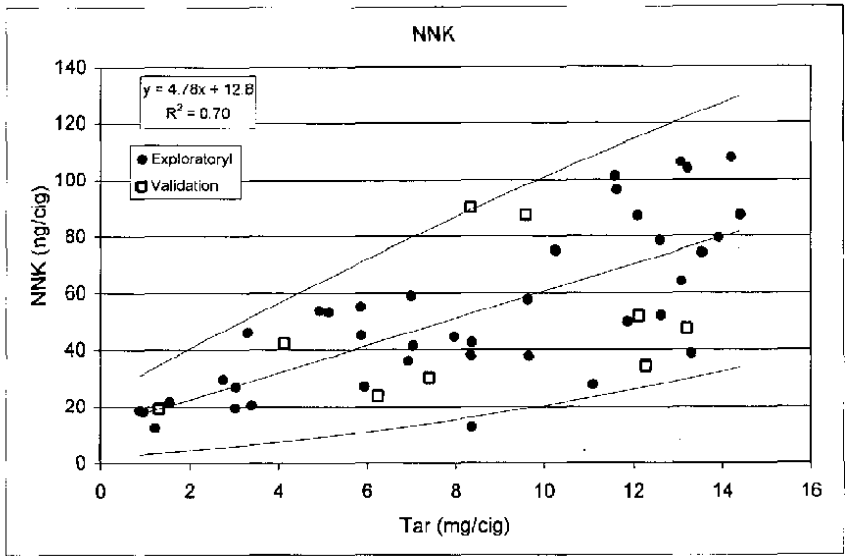


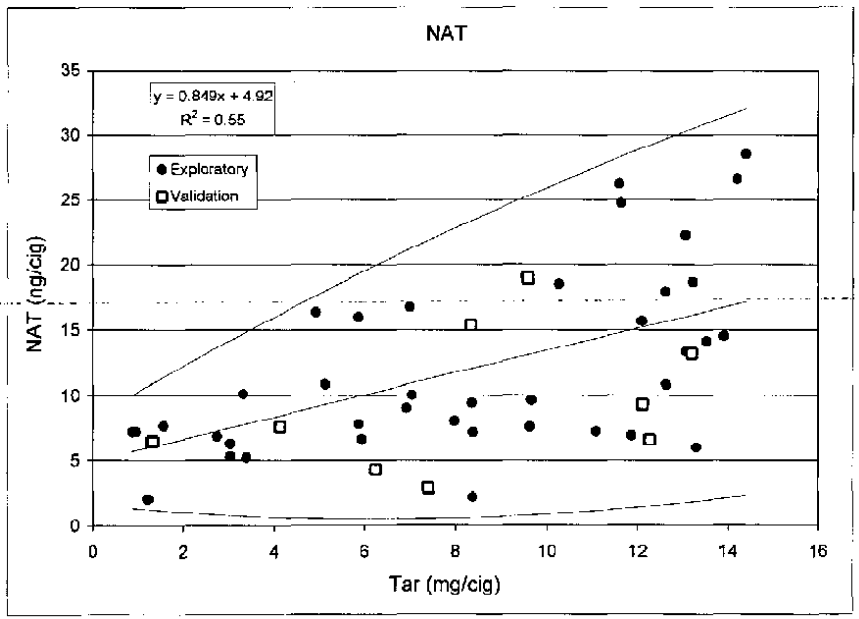
PM3006878245

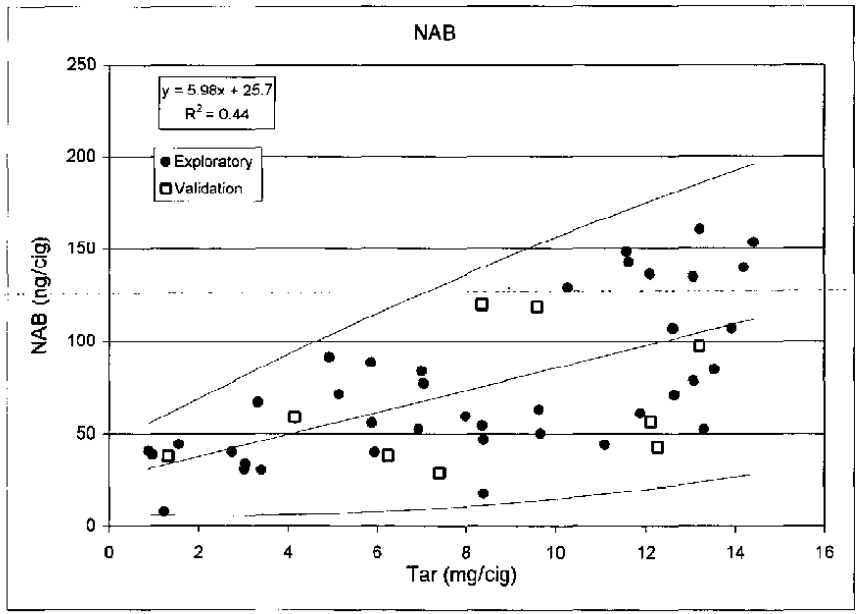
Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 1: Regression Plots from Weighted Linear Regression with 1/tar Weighting





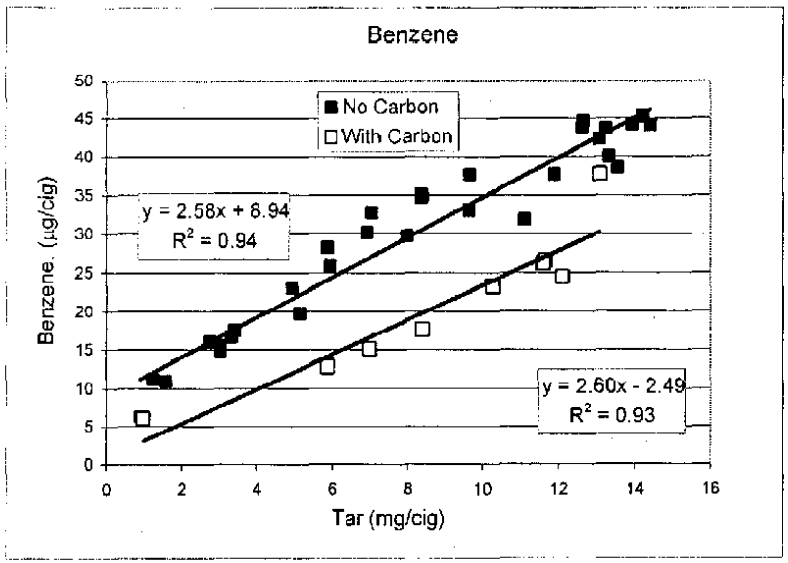


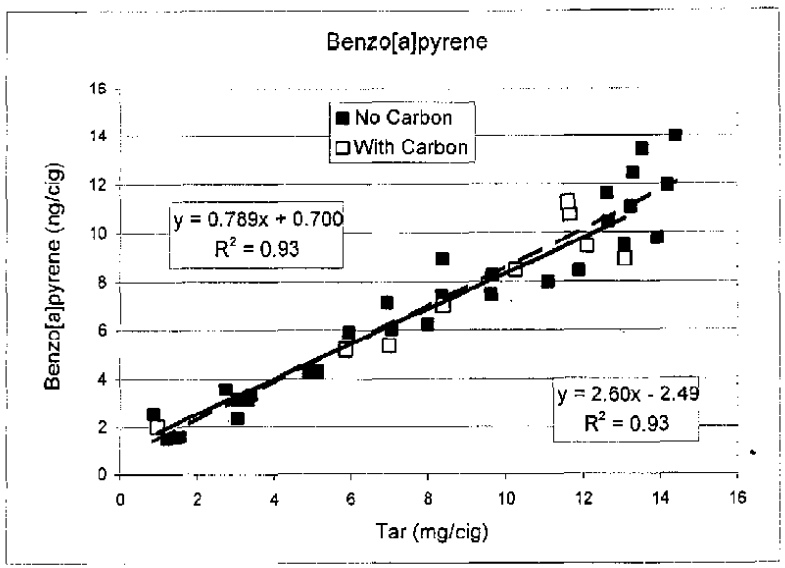


PM3006878246

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 2: Example of Partitioning of Smoke Yields for Carbon Filter Design in Exploratory Brands





PM3006878247

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 7: Weighted Regression Statistics for Vapor Phase Smoke Constituents with Tar and Carbon Factor

Multiple Regression with X1 variable = ISO tar yield per cigarette and X2 variable = Indicator variable for carbon-in-filter

Simple Regression with X variable = ISO tar yield per cigarette

Smoke Constituent	Weighted Multiple Linear (1/tar) with X1 and X2			Weighted Simple Linear (1/tar) with X1		
	RSQ	RMSE	PRESS	RSQ	RMSE	PRESS
acetaldehyde	0.97	15.4	14689	0.96	16.6	11852
acetone	0.95	9.2	6051	0.93	10.6	4799
acrolein	0.95	1.8	250	0.93	2.1	181
butyraldehyde	0.94	1.3	162	0.91	1.5	96
crotonaldehyde	0.82	1.2	136	0.80	1.3	66
methyl ethyl ketone	0.93	2.7	621	0.89	3.2	417
propionaldehyde	0.95	1.7	219	0.94	1.9	155
acrylonitrile	0.94	0.4	10	0.92	0.4	7
benzene	0.93	1.4	163	0.86	2.0	173
1,3-butadiene	0.96	1.2	70	0.95	1.4	88
isoprene	0.93	13.3	9129	0.91	15.8	10270
styrene	0.86	0.5	22	0.80	0.6	14
toluene	0.93	2.3	469	0.87	3.1	393
hyrdrogen cyanide	0.92	6.2	2835	0.91	6.5	1730
mercury	0.95	0.1	0	0.91	0.1	0

change to X

1) RSQ = R^2 = Coefficients of determination

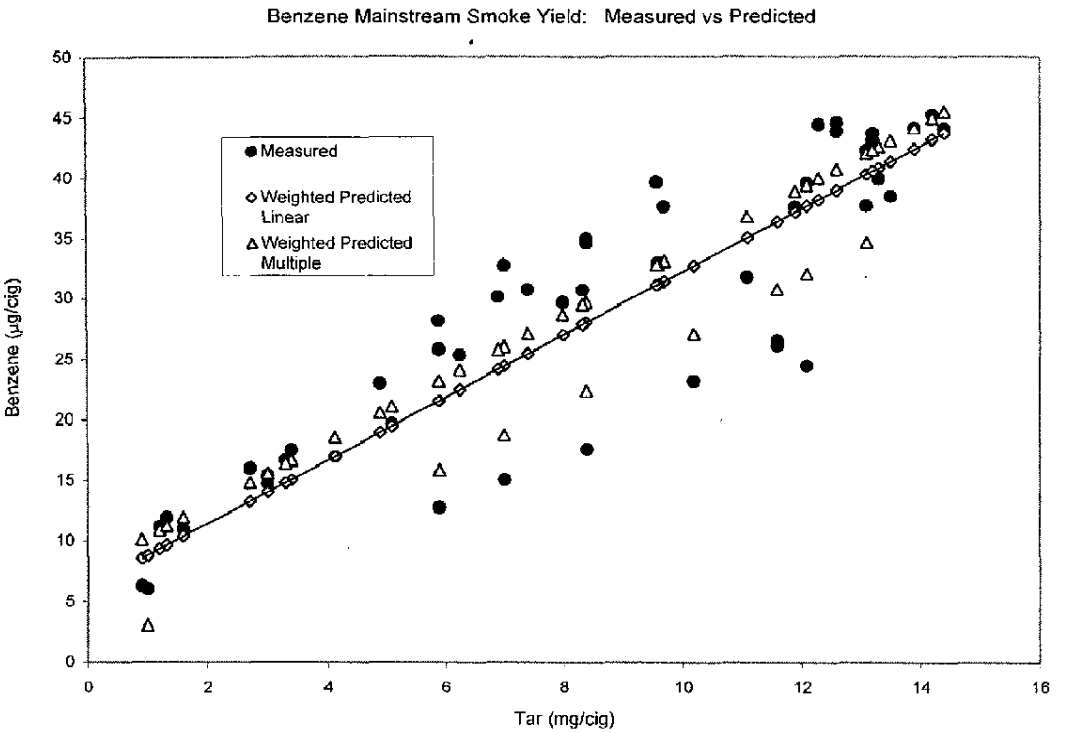
2) RMSE = Root mean square errors

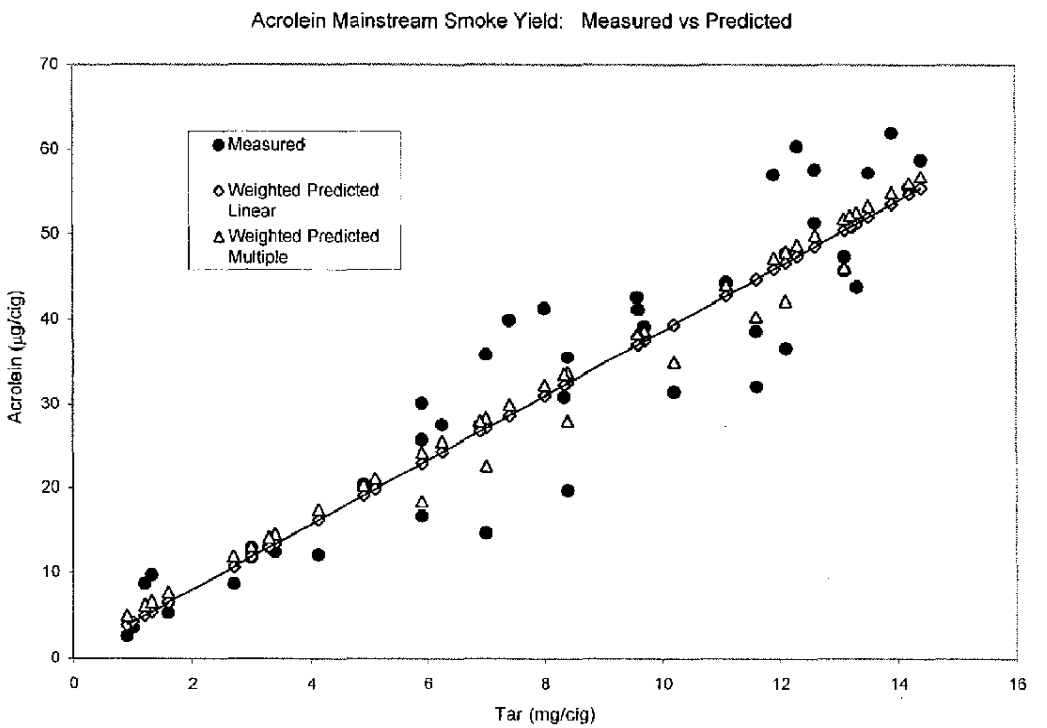
3) PRESS = Predicted residual error sum of squares

PM3006878248

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 3: Multiple Regression Examples with ISO Tar and Carbon Factor





PM3006878249

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 8: Averaged Constituent Yields in Tobacco Filler

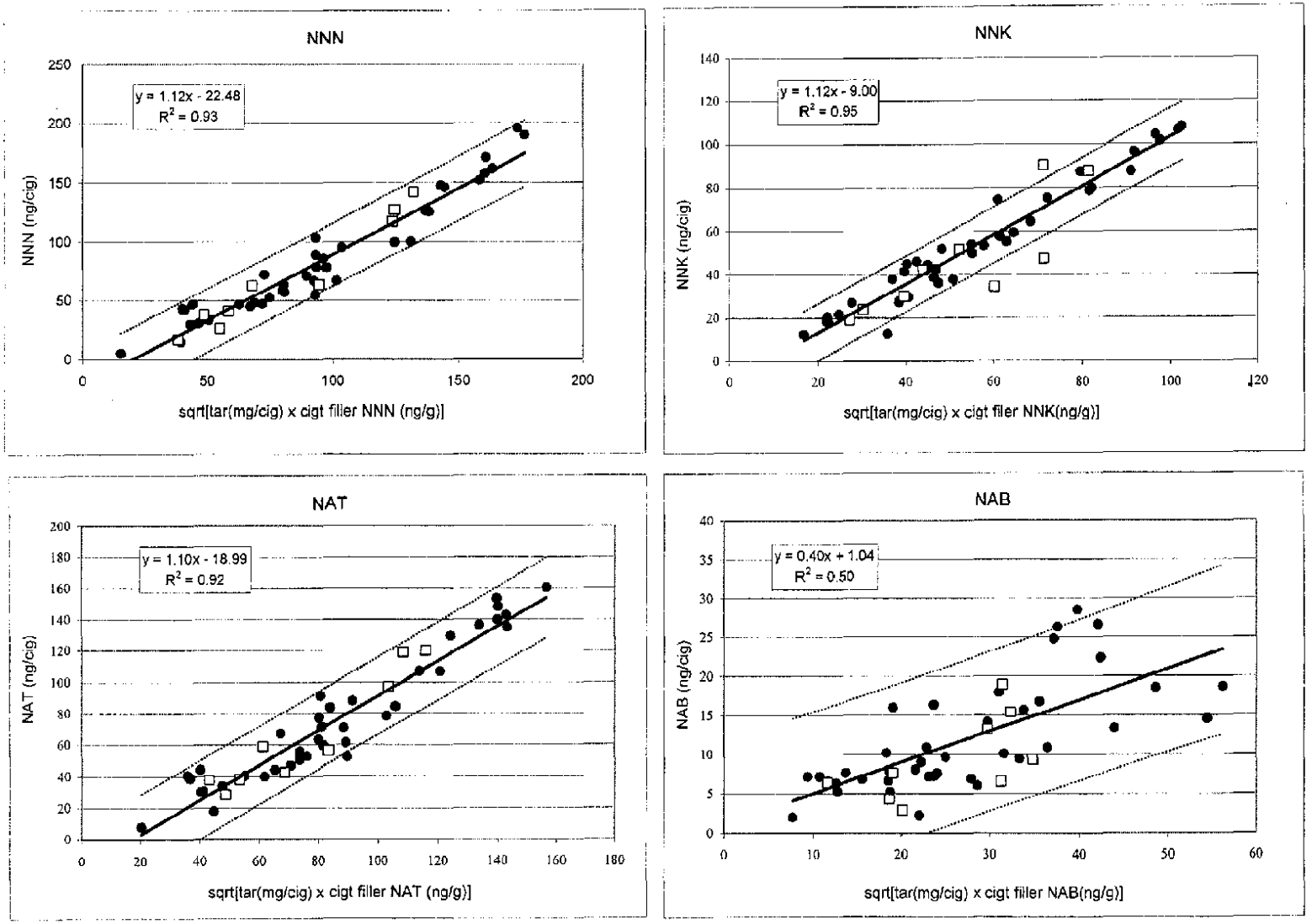
Sample Code	Nitrate (mg/g)		NNN (ng/g)		NNK (ng/g)		NAB (ng/g)		NAT (ng/g)	
Exploratory	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
E1	7.8	1.1	1110	102	NQ	NQ	155	29	914	50
E2	8.7	1.3	2220	123	400	29	254	13	1646	76
E3	8.9	0.7	3736	243	1124	196	379	70	2945	145
E4	7.5	0.8	1188	168	NQ	NQ	194	39	895	95
E5	9.8	1.1	2780	81	709	48	322	37	2106	105
E6	10.9	2.6	2736	38	860	154	262	21	2253	232
E7	9.3	0.3	1866	25	812	46	357	37	1559	44
E8	10.9	1.3	2354	116	1058	39	320	35	1786	126
E9	7.8	0.3	1273	47	NQ	NQ	221	19	1082	47
E10	9.0	0.5	2170	307	591	95	244	58	1339	129
E11	10.6	0.8	3769	84	1194	34	195	18	2883	90
E12	4.1	0.2	332	35	NQ	NQ	NQ	NQ	423	38
E13	11.3	1.5	3892	281	1171	123	213	15	3139	210
E14	5.7	0.7	1355	81	445	24	NQ	NQ	1142	49
E15	9.6	0.2	2520	132	1060	82	156	9	1942	47
E16	9.4	0.1	3149	212	1165	48	172	33	2392	160
E17	10.5	1.1	2722	91	1116	105	188	7	2073	135
E18	8.3	1.2	2012	200	715	28	NQ	NQ	1562	187
E19	5.8	0.8	1361	61	469	57	NQ	NQ	1207	176
E20	7.7	0.6	868	72	NQ	NQ	NQ	NQ	778	64
E21	10.5	1.4	3739	290	1127	49	255	12	2989	161
E22	6.8	0.6	919	160	427	44	NQ	NQ	890	140
E23	5.5	0.8	996	79	423	60	NQ	NQ	959	61
E24	10.9	0.7	3302	38	1147	45	212	6	2477	78
E25	5.6	1.4	1094	37	NQ	NQ	NQ	NQ	1014	34
E26	11.3	0.9	3438	142	1270	17	116	37	2676	53
E27	5.7	0.8	1216	76	474	40	NQ	NQ	1092	30
E28	12.6	1.2	3350	159	923	88	176	12	2170	162
E29	10.4	1.1	2888	237	1193	66	207	8	2366	148
E30	9.1	0.2	2524	271	767	52	138	8	2171	100
E31	4.9	0.2	420	34	490	75	NQ	NQ	715	54
E32	6.9	0.2	1901	307	453	18	NQ	NQ	1482	238
E33	8.5	0.5	2353	189	811	58	150	17	2015	141
E34	7.0	0.4	1365	24	406	71	NQ	NQ	1060	15
E35	8.9	1.7	1430	187	675	29	NQ	NQ	1148	114
E36	10.6	0.8	3105	48	1189	185	186	18	2339	36
E37	7.1	1.2	1619	84	488	36	NQ	NQ	1425	46
E38	9.7	0.3	2223	192	434	19	NQ	NQ	1302	25
E39	8.8	0.3	1922	401	481	57	NQ	NQ	1609	254
Validation										
V1	7.9	0.6	3583	78	1042	153	215	19	2763	111
V2	8.1	0.8	321	36	382	46	NQ	NQ	495	29
V3	6.1	0.8	1012	47	NQ	NQ	NQ	NQ	843	46
V4	8.3	1.3	2101	173	885	134	165	11	1714	93
V5	10.5	1.0	3938	275	1249	198	227	35	3102	132
V6	10.6	0.2	2360	185	1009	161	150	16	1784	127
V7	4.5	0.4	376	61	399	66	NQ	NQ	601	18
V8	7.0	0.5	1778	72	591	58	NQ	NQ	1244	56
V9	7.0	0.7	1171	151	358	41	158	31	912	113
Reference										
R1	15.4	0.4	2433	268	973	36	177	33	1942	227
R2	16.2	1.4	2197	96	1020	72	173	25	1844	8

(1) BDL = below the detection limit, NQ = below the limit for quantitation
(2) Limits of quantitation (LOQ) for tobacco specific nitrosamines in tobacco: NNK LOQ = 272 ng/g, NAB LOQ = 103 ng/g, NAT LOQ = 213 ng/g

PM3006878250

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

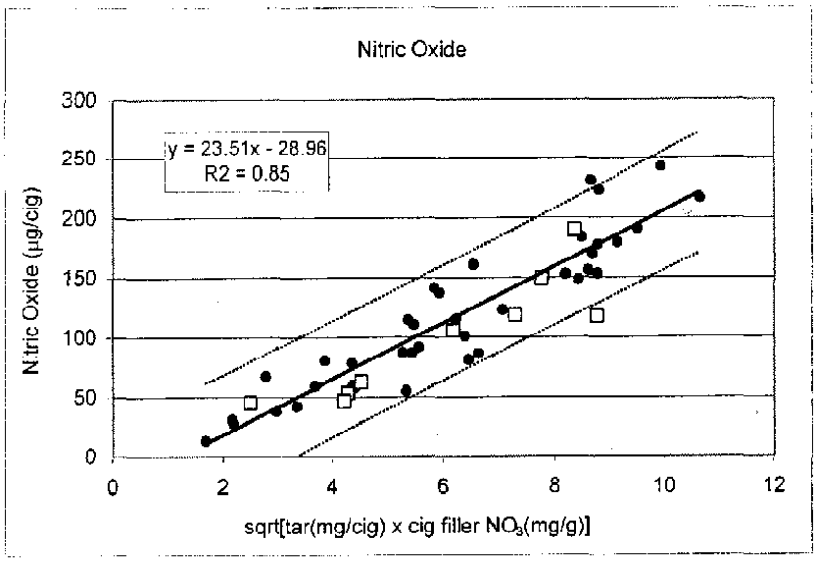
Figure 4: Prediction Models for ISO Mainstream Tobacco Specific Nitrosamine Yields

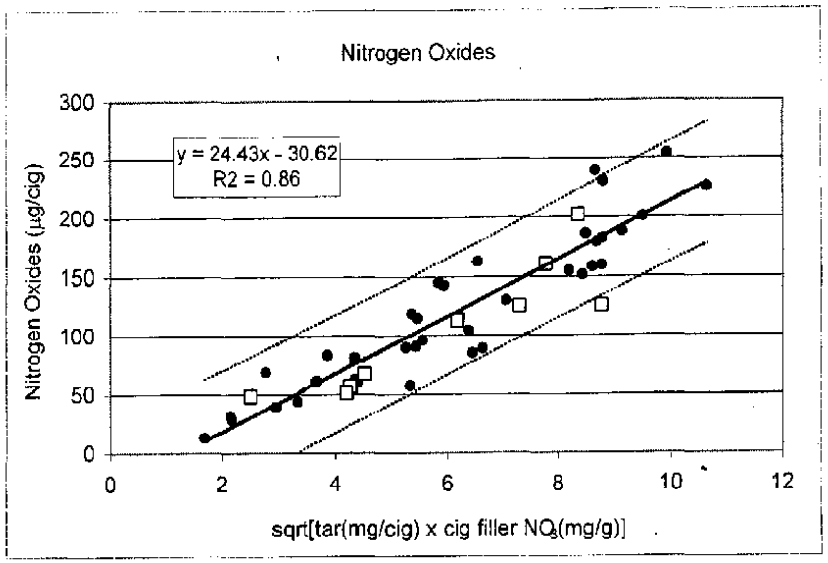


PM3006878251

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Figure 5: Prediction Models for ISO Mainstream Nitrogen Oxides Yields





PM3006878252

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 10: Variability of Analytical Methods with Time in the Analysis of 1R4F

Labstat Study # 1R4F	Units	N	Sep-00		Oct-00		Mar-01		May-01		Jul-01		Means	SEM	95% CI		95% CI % of Means
			mean	sd	mean	sd	mean	sd	mean	sd	mean	sd			Upper	Lower	
tar	mg/cig	20	9.6	0.4	8.7	0.3	9.1	0.4	8.9	0.4	9.2	0.3	9.1	0.3	9.8	8.4	7%
nicotine	mg/cig	20	0.77	0.03	0.73	0.03	0.73	0.04	0.77	0.07	0.76	0.03	0.75	0.02	0.79	0.72	5%
carbon monoxide	mg/cig	20	12.0	0.7	11.6	0.3	11.6	0.6	12.2	0.5	12.0	0.6	11.9	0.3	12.5	11.3	5%
water	mg/cig	20	0.80	0.21	0.82	0.10	0.67	0.13	0.84	0.20	0.91	0.22	0.81	0.09	0.98	0.64	21%
MS TPM	mg/cig	20	11.1	0.5	10.2	0.3	10.5	0.5	10.5	0.4	10.9	0.4	10.7	0.3	11.3	10.0	6%
cigarette weight	mg/cig	20	1070	10	1061	12	1068	11	1065	12	1076	9	1068	6	1079	1057	1%
puff count	#/cig	20	8.7	0.3	8.3	0.3	8.6	0.3	8.3	0.3	8.7	0.2	8.5	0.2	8.9	8.1	5%
acetaldehyde	µg/cig	7	588	47	612	43	574	57	518	43	505	61	560	46	649	470	16%
acetone	µg/cig	7	291	23	288	17	312	22	282	21	305	35	296	13	320	271	8%
acrolein	µg/cig	7	50.0	4.6	46.1	4.1	48.3	4.8	38.5	3.4	53.9	8.4	47.0	5.7	58.1	35.8	24%
butyraldehyde	µg/cig	7	29.5	2.9	29.6	1.2	36.8	3.6	35.1	5.5	35.3	4.5	33.8	4.2	42.0	25.7	24%
crotonaldehyde	µg/cig	7	12.0	0.8	13.0	1.0	14.9	1.5	15.4	1.5	14.0	2.8	13.9	1.4	18.6	11.1	20%
methyl ethyl ketone	µg/cig	7	55.9	2.8	57.3	2.9	75.0	6.4	63.8	5.4	74.0	6.8	65.2	9.0	82.8	47.6	27%
propionaldehyde	µg/cig	7	49.3	2.7	50.6	2.8	55.9	5.6	48.1	3.8	46.3	5.4	50.1	3.6	57.2	42.9	14%
acrylonitrile	µg/cig	7	9.1	0.9	7.8	1.1	8.3	0.8	9.2	0.5	10.1	0.9	8.9	0.9	10.6	7.1	20%
benzene	µg/cig	7	42.1	2.5	32.4	2.8	40.5	2.6	37.3	3.1	42.2	2.3	38.0	4.1	47.0	30.8	21%
1,3-butadiene	µg/cig	7	45.7	3.2	33.7	1.7	42.8	3.3	39.0	2.3	36.7	1.5	40.0	4.6	48.9	31.0	22%
isoprene	µg/cig	7	356	21	306	16	397	19	342	27	394	18	359	38	433	285	21%
styrene	µg/cig	7	7.2	0.7	6.5	0.6	7.1	0.2	7.7	0.3	6.8	0.5	7.1	0.5	8.0	6.2	13%
toluene	µg/cig	7	67.9	4.7	55.7	4.8	65.2	5.0	61.2	5.4	69.5	4.7	63.9	5.5	74.8	53.0	17%
hydrogen cyanide	µg/cig	7	128.3	11.0	125.0	4.4	130.2	10.5	121.3	10.8	108.9	9.8	122.9	8.6	139.9	106.0	14%
nitric oxide	µg/cig	7	297	18	282	30	317	21	283	25	294	30	295	14	323	267	9%
nitrogen oxides	µg/cig	7	311	19	291	32	331	22	296	25	312	37	308	16	340	277	10%
mercury	ng/cig	7	5.3	0.9	5.8	0.5	5.2	0.4	6.3	0.3	5.0	0.4	5.5	0.5	6.5	4.5	19%
formaldehyde	µg/cig	7	22.6	1.4	18.0	2.3	26.4	7.3	19.3	1.8	17.9	3.0	20.8	3.7	28.0	13.7	34%
ammonia	µg/cig	7	13.8	1.4	12.6	1.0	13.4	0.5	14.1	1.0	12.9	1.0	13.4	0.6	14.6	12.1	9%
1-aminonaphthalene	ng/cig	7	18.5	5.5	14.2	0.5	20.0	4.5	18.4	1.4	16.7	0.9	17.6	2.2	21.9	13.2	25%
2-aminonaphthalene	ng/cig	7	11.9	2.3	10.1	1.0	11.9	2.3	11.7	0.5	10.9	0.5	11.3	0.8	12.8	9.8	13%
3-aminobiphenyl	ng/cig	7	2.96	0.27	2.54	0.19	2.97	0.45	3.08	0.20	2.77	0.27	2.86	0.21	3.28	2.45	14%
4-aminobiphenyl	ng/cig	7	2.13	0.23	2.01	0.13	2.30	0.36	2.33	0.17	2.10	0.11	2.17	0.14	2.44	1.91	12%
benzo[a]pyrene	ng/cig	7	6.85	0.57	6.56	0.43	7.33	1.39	6.74	0.70	7.26	0.84	6.95	0.33	7.80	6.29	9%
catechol	µg/cig	7	34.8	3.4	39.8	1.9	40.9	2.0	34.3	0.8	36.2	1.2	37.6	3.0	43.4	31.8	15%
m & p-cresols	µg/cig	7	8.3	0.9	8.2	0.7	8.4	0.4	7.0	0.4	7.0	0.7	7.8	0.7	9.2	6.4	18%
o-cresol	µg/cig	7	3.54	0.34	3.27	0.15	3.50	0.29	2.88	0.15	2.81	0.38	3.20	0.34	3.87	2.53	21%
hydroquinone	µg/cig	7	41.4	5.6	44.7	2.1	38.2	1.9	37.9	2.3	38.1	0.9	40.3	2.9	45.9	34.7	14%
phenol	µg/cig	7	12.1	2.1	10.9	0.7	11.3	0.5	9.7	0.8	8.0	0.5	10.4	1.6	13.5	7.3	30%
resorcinol	µg/cig	7	0.49	0.03	NQ		0.86	0.08	0.81	0.03	NQ		0.72	0.20	1.11	0.32	55%
pyridine	µg/cig	7	6.9	0.3	7.8	0.4	8.0	0.4	8.5	0.6	6.7	0.5	7.6	0.8	9.1	6.1	20%
quinoline	µg/cig	7	0.30	0.02	0.32	0.05	0.28	0.02	0.30	0.02	0.26	0.02	0.30	0.02	0.34	0.25	15%
NNN	ng/cig	7	142.0	15.4	110.0	3.9	106.8	4.1	109.5	13.4	108.9	1.7	115.4	14.9	144.7	86.2	25%
NNK	ng/cig	7	119.8	15.2	86.2	12.2	75.6	8.5	87.7	12.4	89.1	8.6	91.7	16.6	124.2	59.1	35%
NAT	ng/cig	7	160.2	15.0	127.0	2.6	117.8	7.6	126.9	11.0	130.0	5.6	132.4	16.2	164.1	100.6	24%
NAB	ng/cig	7	37.2	8.6	24.1	2.9	25.3	3.1	21.8	2.1	20.2	2.2	25.7	6.7	38.0	12.6	51%
cadmium	ng/cig	7	62.8	3.0	66.0	4.6	68.7	1.7	62.2	4.6	62.3	4.9	64.4	2.9	70.0	58.8	9%
lead	ng/cig	7	35.5	1.9	36.9	2.7	39.2	1.9	35.6	2.9	36.3	1.9	36.7	1.5	39.6	33.7	8%
chromium	ng/cig	7	10.2	7.7	n/a		BDL		BDL		BDL		10.2				
nickel	ng/cig	7	6.8	3.3	n/a		BDL		BDL		BDL		6.8				
arsenic	ng/cig	7	4.1	3.2	n/a		5.0	0.9	3.9	0.3	5.6	0.8	4.7	0.8	6.2	3.1	33%
selenium	ng/cig	7	BDL		n/a		BDL		BDL		BDL		BDL		BDL		
Smoke pH		7	6.12	0.08	6.08	0.11	5.92	0.04	5.97	0.10	5.99	0.05	6.01	0.08	6.17	5.86	3%

PM3006878253

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 11: Mainstream Smoke Constituent Yields for a Commercial Brand Over a Nine-month Period

Analysis		Avg of Means	Std Error (SD of Means)	95% Confidence Interval Lower	95% Confidence Interval Upper	+/- 95% CI % of Mean
tar	mg/cig	6.1	0.2	5.8	6.5	6%
nicotine	mg/cig	0.53	0.01	0.51	0.55	4%
carbon monoxide	mg/cig	7.4	0.4	6.7	8.1	10%
acetaldehyde	µg/cig	428	38	353	503	18%
acetone	µg/cig	248	24	200	296	19%
acrolein	µg/cig	44.9	4.7	35.7	54.2	21%
butyraldehyde	µg/cig	30.5	3.5	23.8	37.3	22%
crotonaldehyde	µg/cig	9.8	1.9	6.1	13.5	38%
methyl ethyl ketone	µg/cig	52.3	4.7	43.1	61.6	18%
propionaldehyde	µg/cig	34.6	3.5	27.9	41.4	20%
acrylonitrile	µg/cig	8.5	2.3	4.0	13.0	53%
benzene	µg/cig	29.7	4.0	21.9	37.4	26%
1,3-butadiene	µg/cig	30.1	3.3	23.6	36.6	22%
isoprene	µg/cig	272	30	212	331	22%
styrene (vapor phase)	µg/cig	2.0	0.6	0.7	3.2	63%
toluene	µg/cig	39.4	8.5	22.8	56.0	42%
formaldehyde	µg/cig	9.6	2.1	5.6	13.6	42%
benzo[a]pyrene	ng/cig	5.19	0.21	4.78	5.60	8%
benz[a]anthracene	ng/cig	9.54	0.67	8.22	10.87	14%
NNN	ng/cig	87.6	6.8	74.2	100.9	15%
NNK	ng/cig	65.6	8.5	49.0	82.2	25%
NAT	ng/cig	80.4	5.8	69.0	91.9	14%
NAB	ng/cig	9.5	0.8	7.9	11.1	17%
					Avg for Constituents =	+/- 26%

95% Confidence Interval = average of means +/- 1.96(std error)

PM3006878254

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 12: Comparison of Reported Kentucky Reference 1R4F Cigarette Mainstream Smoke Constituent Yields from Different Laboratories

Reference		Contract Lab A	Contract Lab B	(Gardner, 2000)	(Chepiga, 2000)	(LGC, 2000b, 2002a, b))	Ratio Max / Min
Smoke Method		ISO	FTC	FTC	FTC	ISO	
tar	mg/cig	9.1	10.0		8.70		1.15
nicotine	mg/cig	0.73	0.82		0.78		1.12
carbon monoxide	mg/cig	11.6	13.4		11.0		1.22
acetaldehyde	µg/cig	574	677	640	707		1.23
acetone	µg/cig	312	273	284	284		1.15
acrolein	µg/cig	46.3	65.5	65.0	59.7		1.42
butyraldehyde	µg/cig	38.8	33.3				1.16
crotonaldehyde	µg/cig	14.9	18.9				1.27
methyl ethyl ketone	µg/cig	75.0	95.1				1.27
propionaldehyde	µg/cig	55.9	57.0				1.02
acrylonitrile	µg/cig	8.3	10.7	13.9		14.2 ('02b)	1.71
benzene	µg/cig	40.5	47.8	44.2		27.3 ('02b)	1.75
1,3-butadiene	µg/cig	42.8	40.6	36.5		50.5 ('02b)	1.38
isoprene	µg/cig	397	418	366		225 ('02b)	1.85
styrene	µg/cig	7.1	7.3			0.76 ('02b)	9.67
toluene	µg/cig	65.2	89.1	73.3		37.96 ('02b)	2.34
hydrogen cyanide	µg/cig	130.2	122.2	165	144		1.35
nitric oxide	µg/cig	317	254			311 ('00b)	1.25
nitrogen oxides	µg/cig	331		258	266		1.28
mercury	µg/cig	5.2	4.6				1.12
formaldehyde	µg/cig	26.4	22.0	8.50	12.5		3.11
ammonia	µg/cig	13.4	11.9	16	16.8		1.58
1-aminonaphthalene	ng/cig	20.0	10.2				1.95
2-aminonaphthalene	ng/cig	11.9	6.6	10.9			1.80
3-aminobiphenyl	ng/cig	2.97	1.80				1.65
4-aminobiphenyl	ng/cig	2.30	1.43	4.0			2.79
benzo[a]pyrene	ng/cig	7.33	4.84	5.40	4.60	7.10 ('02a)	1.59
catechol	µg/cig	40.9	40.6	45.3	43.5		1.12
m & p-cresols	µg/cig	8.4	7.5	7.60	7.20		1.17
o-cresol	µg/cig	3.50	3.04				1.15
hydroquinone	µg/cig	39.2	35.5	42.9	39.8		1.21
phenol	µg/cig	11.3	10.5	8.90	9.60		1.26
resorcinol	µg/cig	0.86	0.48				1.77
pyridine	µg/cig	8.0	4.1				1.97
quinoline	µg/cig	0.28	0.21	0.23			1.33
NNN	ng/cig	106.8	100.0	115	67.0		1.72
NNK	ng/cig	75.6	85.8	97.0	78.0		1.28
NAT	ng/cig	117.8	107.3	126	93.0		1.35
NAB	ng/cig	25.3	18.0				1.41
cadmium	ng/cig	68.7	68.8				1.00
lead	ng/cig	39.2	38.9				1.01
arsenic	ng/cig	4.7	6.0				1.28
						Average (excluding styrene) constituent range % =	1.50

PM3006878255

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001

Table 9: Average Measured Yield Coefficient of Variation (%CV) and Absolute Relative Prediction Errors (ARPE) for Validation Brands

Smoke Constituent	Average % CV [2]	Average ARPE[1] Simple with tar (weighted)	Multiple: tar and carbon factor (weighted)	Simple with (tar x Filler NO_3)$^{0.5}$
acetaldehyde	10%	16%	15%	
acetone	8%	12%	11%	
acrolein	11%	18%	17%	
butyraldehyde	11%	17%	15%	
crotonaldehyde	13%	25%	25%	
methyl ethyl ketone	9%	17%	15%	
propionaldehyde	9%	14%	13%	
acrylonitrile	7%	22%	19%	
benzene	5%	11%	7%	
1,3-butadiene	6%	16%	13%	
isoprene	6%	13%	10%	
styrene	13%	22%	16%	
toluene	6%	15%	10%	
hydrogen cyanide	9%	21%	21%	
mercury	9%	22%	19%	
nitric oxide	11%	na	na	26%
nitrogen oxides	10%	na	na	24%

Smoke Constituent	Average % CV [2]	Average ARPE[1] Simple with tar (weighted)	Simple with (tar x Filler TSNA)$^{0.5}$
formaldehyde	15%	22%	
ammonia	8%	19%	
1-aminonaphthalene	14%	15%	
2-aminonaphthalene	12%	23%	
3-aminobiphenyl	8%	17%	
4-aminobiphenyl	6%	17%	
benzo[a]pyrene	9%	20%	
catechol	7%	18%	
m & p-cresols	7%	29%	
o-cresol	8%	27%	
hydroquinone	7%	19%	
phenol	8%	22%	
resorcinol	7%	10%	
pyridine	14%	21%	
quinoline	9%	23%	
NNN	11%	na	17%
NNK	14%	na	21%
NAT	8%	na	17%
NAB	16%	na	60%
cadmium	10%	21%	
lead	21%	15%	

*(1) absolute relative prediction error = ((absolute prediction error)/measured yield)*100*

*(2) %CV = (measured yield standard deviation/mean measured yield)*100*

PM3006878256

Source: https://www.industrydocuments.ucsf.edu/docs/yxlx0001